THE AUTOMOBILE

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FIRST OF THE SHOWS

Tells the Amazing Growth of a Great Industry

GRAND CENTRAL PALACE

MAIN HALL OF THE GRAND CENTRAL PALACE, WHICH WAS PLENTEOUSLY DRAPED IN BUNTING TO HIDE ITS HOMELY APPEARANCE.

A GREAT INDUSTRY WITH A GREATER FUTURE

By A. G. BATCHELDER.

BEGINNING with a few scattered and meager displays that were reluctantly given space in a bicycle show—and this only six years ago—the automobile industry now finds itself too expansive to be confined in the two largest structures available for exhibition purposes in New York City.

The Grand Central Palace show, which opened Saturday last, contains the most recent additions to the list of automobile builders, and they are many in number, well backed with capital, and present models that speak for themselves.

True it is that the A. L. A. M. show, in January, at Madison Square Garden, will house the more established makers, but it is the substantial list of newcomers that tells the prosperous story of the amazing growth of the industry during the past year.

The place for a national exhibition unquestionably is in New York City, and of the thousands that have visited the Lexington avenue building there are many who come from distant places, either seeking agencies or else buying cars for personal use. Annually the automobile shows in the metropolis supply an excellent reason to out-of-town autoists-that-are and autoists-that-are-to-be for visiting the city—and they certainly come in substantial numbers, as is plainly evident by the congested state of the hotels.

The Promoter of the Show.

The Automobile Club of America, organized in 1899 "for the purpose of encouraging and developing the automobile sport and industry in America," deserves both prestige and profit for the work which it has done in the promotion of this and previous shows. If it were not for the A. C. A.—substantially assisted last year and this year by the American Motor Car Manufacturers' Association—in all likelihood there would be no opportunity for those concerns to exhibit which are willingly or unwillingly non-observers of the Selden patent. With every foot of available space overapplied for, the A. L. A. M. naturally provides first for its own members, and even then finds spacious Madison Square Garden entirely too cramped for satisfactory exhibition purposes.

It is unfortunate that this great, big city does not possess a building similar to what is available to the French makers, for divided into two shows the magnitude of this great industry, with its still greater future, is unappreciated except by the comparatively few who are involved directly in its machinery. In capital invested, men employed, and total output, the automobile industry of this country, with its innumerable side lines, leads without question in magnitude the grand total of any other country—not excepting France, the first home of the automobile, and the fortunate possessor of roads that encourage the building and selling of motor-driven vehicles.

The A. C. A. Exhibition Committee, consisting of Gen. George Moore Smith, chairman; William Pierson Hamilton, Alan R. Hawley, and S. M. Butler, secretary, accomplished wonders in transforming the inconveniently-built, frayed, and battered Grand Central Palace into a fairly acceptable resting place for the display of brilliantly-coated automobile bodies and shining chassis, reassuring detachable tire rims, polished headlights to tell the way, and all else that figures in the many-parted motor traveler. There is nothing strikingly elaborate; rather a substantiality in the decorations that harmonizes with the tone of an industrial display. The club emblems are plentiful, and, if one were to find fault, he might ask for a little less bunting and accept more of the building's uninviting nakedness.

A year ago the A. C. A. had the handicap of forcing the completion of a new building, attendant with which were many annoying and expensive difficulties, and this year it was obliged to accept a Hobson's choice and take an old building in dilapidated condition from cellar to garret. But the Exhibition Committee was bound to have a show, and again it must be excused for patting itself upon the back, and, Saturday night, rest, tired, but happy, over the completion of another success that accentuates the worth of the organization to automobiling in general.

The A. M. C. M. A. in the Show.

But in the success of last year and again this year there is no small amount of credit forthcoming to the American Motor Car Manufacturers' Association, which on both occasions has supplied many exhibitors and utilized much of the space. General Manager Alfred Reeves, Chairman Benjamin Briscoe, and associates J. D. Bartholomew and A. C. Newby, of the Show Committee, have been prominent in this part of the labor. Possessing a membership of thirty-nine, including such well known names as Maxwell, Ford, Premier, Reo, Duryea, Mitchell, National, Marmon, and others scarcely less prominent, the A. M. C. M. A. wields a trade influence second only to the older makers' organizations.

Foreign Makes are Representative.

The A. C. A. membership, generally speaking, in the past has been considered likely buyers of foreign cars, and therefore it was to be expected that the Palace show would have a very complete line of the models of the European makers. The expectation was realized, and the best of the foreigners, including the established Renault, C. G. V., Mors, Mercedes, Napier, Martini, English Daimler, Gobron-Brillie, and Panhard, are in evidence, besides others more recently introduced here, the latter embracing such names as Westinghouse, Delahaye, and Pilain.

Certainly the present show embraces everything from the costliest car made down to the little runabout, the owner of which as a rule obtains more pleasure and profit out of his car than does the possessor of the ponderous touring vehicle, of which there are a large number. In fact, it would seem that the tendency toward big cars had gone a bit too far in the plans of a majority of the makers, who, however, may have considered the big vehicle as the most certain way of attracting attention in the show. But the natty runabouts, both of high and low power, are centers of undisguised interest to the throngs, in the makeup of which it is easily to be seen that the buyer of the present or the intended buyer of the future is frequently encountered.

The crowded aisles, the undeniably inquisitive visitor, the prevalence of the fair sex, all contributed emphasis to the growing belief that the automobile is the greatest blessing of the century—a healthful time-saver, abused occasionally in the hands of reckless or incompetent drivers, but vastly beneficial to the majority.

Air Navigators are Optimistic.

The next phase of motoring is adequately described in the Palace show. The Aero Club of America has a department which tells of past, present, and future in air navigation, a subject more or less allied to the automobile owing to the fact that the motor which drives the land vehicle in a slightly modified form is to be the means by which the sky pilots confidently expect to attain their long-cherished ideas of flying through space. Some of the brightest minds in the country are centered on the aerial problem, and the optimist now will tell one without any hesitation whatever that in the next few years flying machines will become an accomplished fact. The heavier-than-air type of aeroplane is the particular thing on which all efforts are practically directed. The aeronautical room at the Palace is one of the most interesting and lively departments of the show. Here also are given the moving pictures of the Vanderbilt Cup race and various aeronautical events.

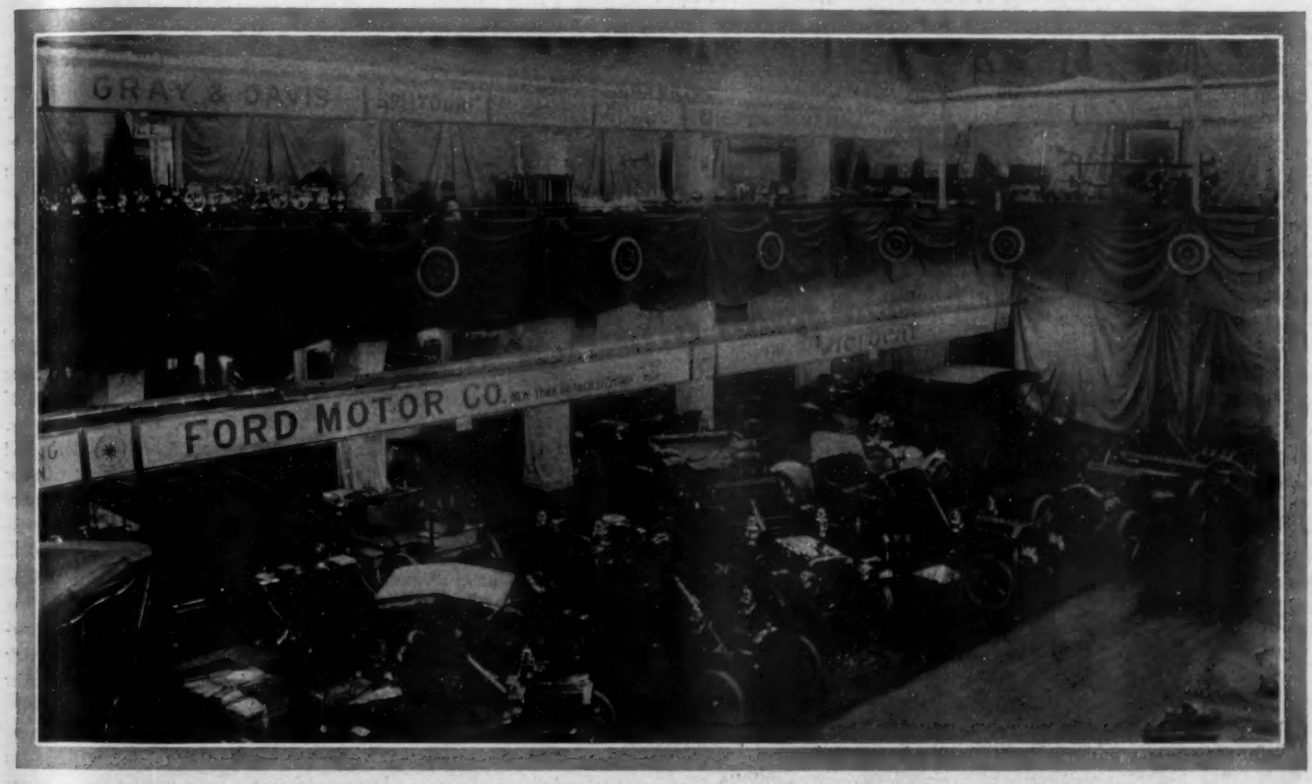
What the show situation may develop in the next year cannot safely be predicted. The A. C. A., however, announces positively that it will hold a 1907 show in the Grand Central Palace, with dates in late November or early December.

WHAT THE ESTABLISHED MAKERS PRESENT

By VICTOR LOUGHEED.

THERE seems to be a marked tendency, basing the deduction on the Grand Central Palace Show, for makers of small cars to progress to the manufacture of larger ones, while the makers of the heavy touring cars rarely evince any interest in the low-priced runabout. This tendency is strongly emphasized at the show, and seems to contradict the opinion expressed by many that the time is impending for a reversion to the low-priced car, manufactured in quantity and thus available for the man of moderate means.

There is no possible doubt that the six-cylinder vogue is increasing, and there are fully a dozen six-cylinder machines on view, besides one with eight cylinders. The six-cylinders have it in their favor that the advantages of the construction they approve are very apparent, while the disadvantages are less definite.



THE SHOW AS VIEWED BY THE VISITOR WHO STANDS IN THE SOUTHWEST CORNER OF THE GALLERY.

Anyone can appreciate an unusual smoothness of starting, comparative reliability of self-starting, and the even development of power, but it is a much more difficult matter to point out to the "man in the street" any serious disadvantage due to the addition of two more cylinders, with all else that this involves in a motor of the usual type.

A significant trend is that toward the friction drive, which never before has been very prominent in the New York automobile shows, but which here for the first time is the feature of at least four undeniably important cars. Hitherto, the friction drive has met with more approval in the West and has been one of the features of the Chicago and other Western shows, but has made less headway with the more sophisticated Eastern purchasers. Now, however, it would seem that the many merits of the friction drive are forcing for it a hearing which is indicated by the crowds at the stands of makers who exhibit it.

One of the American cars that has helped to establish a reputation for American automobiles even abroad, where high-grade, expensive construction has been the rule from the beginning, is the Cleveland for 1907, termed Type H. The most marked change from previous models has to do with the make-and-break ignition system, in which a new means for advancing and retarding the spark is involved; this consists of a single rotating shaft with four worms, the rotation of the shaft being controlled by the spark lever on the steering wheel. A small lever connecting directly with an eccentric that changes the moment of release, works in the worm grooves.

The peculiar frame and running gear construction of the Marmon car is so well known as to need no comment, and it is considerably of a vindication of this idea, which has been harshly criticised in some quarters, that the present show houses at least four high-grade cars of other manufacturers in which a similar system of mounting the power plant is employed. If the adage may be applied, which has it that imitation is the best of flattery, then a distinct point is scored by the Marmon people, if their successes on the road were not enough. The star of the Marmon stand unquestionably is the great eight-cylinder car, one of the largest cars in the show, besides being one of the most powerful air-cooled cars ever built. The cylinders of this car are mounted on the crankcase at an angle of 90 degrees and produce the V-shape characteristic of the smaller car.

The most interesting item of the Maxwell-Briscoe exhibit seems to be the 1907 light touring car of this firm, known as Model HB. The general design of this car, as well as that of the new runabouts, is similar to that of the well-known Maxwell type of the past year. Changes have been made in minor details, notably in the linking of the brakebands, for which hickory wood is used. The Maxwell people seem to consider these wood blocks exceedingly satisfactory and superior in wearing qualities to bronze or fiber. Other good features of former models are retained.

The Glide car for 1907 constitutes a characteristic example of the tendency to manufacture larger and larger cars each season.

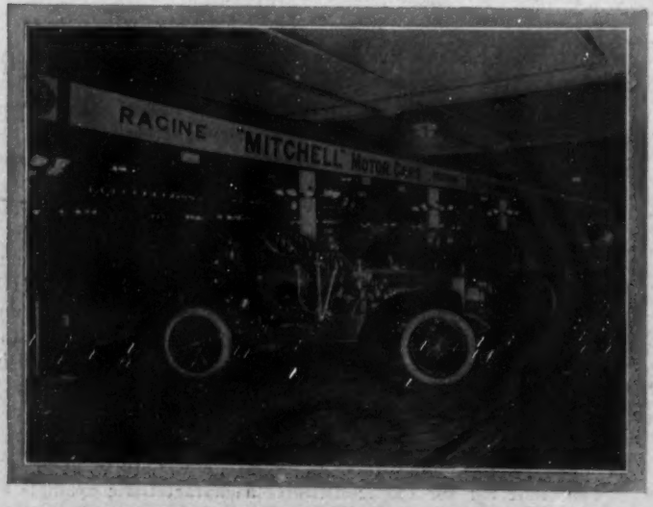
THE WAYNE EXHIBIT IS AMPLE AND WELL ARRANGED.

THE GROUP OF PULLMANS IS ATTRACTIVELY STAGED.

Formerly noted for the production of excellent cars approximating the runabout type, the Glide people have this year come out with two large touring cars, one a five-passenger 40-horsepower machine and the other a seven-passenger car of 60-horsepower. The chief novelty of this vehicle seems to consist in the use of the multiple-disk brakes, constructed in a way similar to the construction of the multiple-disk clutch. The brake of each wheel is said to have in it 400 square inches of contact surface.

Without attempting to cater to the demand for an extraordinarily refined construction, the Rambler line for 1907, as in previous years, makes a direct and definite bid for the custom of the user whose needs are practical needs and who wants results in dollars and cents. The leaders of the Rambler line are four-cylinder touring cars, selling at $2,000 and $2,500, respectively. Both of these cars have four-cylinder vertical motors in front, water-cooled, and not altogether conforming to the usual practice, in that the valves are in the heads and worked by rockers and push rods. Besides the two larger touring cars, there are the Rambler Utility Cars, with horizontal-opposed motors. One of these is the exceptionally novel Rambler runabout, which is so built that the whole body can be tilted readily to one side, exposing the mechanism for examination or adjustment.

The National cars are certain to add much to their good reputation by their 1907 model, of which the six-cylinder 75-horsepower Model L certainly is a thoroughly workmanlike job. The crankshaft of this six-cylinder motor is carried on seven Hess-Bright bearings and is an interesting example of the proper application of these wonderful wear and friction reducers.



AN AMPLITUDE OF MITCHELLS FILLS THIS BIG SPACE.

The Aerocar people for 1907 are making a strong bid to both water-cooling and air-cooling enthusiasts with their two models, one, the smaller, air-cooled in the method that has proved so successful with previous cars of this make, and the other, the water-cooled, of greater power, and according in all its details with the line of standard practice.

The Ford is confining itself to only two models—the six-cylinder touring car and the four-cylinder runabout. The display in the center of the main hall is quite elaborate. The runabout remains practically the same as the 1906 car, and will be produced during 1907 in large quantities.

A genuine automobile bargain seems to be the $1,750 Stoddard-Dayton four-cylinder runabout with water-cooled engine, showing the highest grade construction throughout. The large cars of this make, including the touring car, at $2,500, and the limousine, at $3,500, are splendid examples of the automobile builder's skill and attract a good deal of attention, as much on account of their simple operation as because of their real quality. All these cars are provided with an interlocking safeguard so that the gears cannot be shifted without first releasing the clutch.

The Pullman automobile for 1907 is characteristic for the excellence of its finish, the quality of which is uncommon. Three models are made, a 20-horsepower car, at $1,850, and a 40-horsepower car, for five and seven passengers, respectively. In view of the quality of the construction and the use of four-cylinder motors, the price seems exceptionally low.

As is the case with perhaps half of the manufacturers represented at the show, the Mitchell people are a concern that has evolved from the manufacture of small cars to the manufacture of large ones. The newest 1907 Mitchell is the Model F, a high-power touring car of standard lines, propelled by a 30-horsepower four-cylinder four-cycle vertical engine, driving through a sliding gear and propeller shaft. Following the Model F is the Model D, similar to the larger car, but propelled by a 34-40-horsepower motor. At $1,800, this car is an example of the modern tendency toward fairly low-priced touring cars, capable of carrying five people with a high degree of comfort over ordinary roads. No up-to-date line would be complete without a touring runabout, and in recognition of this fact the 20-horsepower four-cylinder Mitchell runabout is exhibited and comes in for a share of public approval that it richly deserves.

The Lambert is a pioneer in the friction-drive class, and if the exhibit of this car is a criterion, it is advancing most steadily into popularity. The motor is the four-cylinder Rutenber, and, with the exception of the friction transmission, substantially all details afford the most usual current practice.

The Berkshire cars for 1907 are interesting because of the evident conversion of its designers to the general use of Hess-Bright bearings, a step that has been taken only after careful

tests, which have failed to show even a single broken race or ball in extended use. The peculiar Berkshire individual-clutch change-speed gear is retained, the required gears being locked in engagement by four expanding fingers.

For 1907 the Welch cars, six models in all, retain the valves in the head, which has been a feature of the Welch construction for some time. Probably the most interesting car of the Welch line is the Model H, with a six-cylinder motor. The clutch is of the multiple disk type, and is interesting because it presents fully 150 square inches of contact surface between hardened steel and bronze. Apparently the makers of this car have met with ample success with their individual clutch system, since they consistently refuse to become converted to the more popular sliding gear.

The Dorris car, while, like nine out of ten, conforming to standard practices, is one of the water-cooled type, with valves opening direct into the cylinder head. The clutch is of the multiple-disk type and is said to start the car without any jerk whatever.

Another of the medium-priced four-cylinder runabouts is the Logan, at $1,500. The motor of this car is air-cooled, with a 4-inch bore and a 4-inch stroke. The Hassler transmission is used.

Nothing "radical" or "sensational," is the slogan of the Moline for the coming selling season. The product of this factory consists of four cars, a 35-horsepower touring car and a 24-horsepower touring car, both with four-cylinder engines. Besides these there is a 20-horsepower four-cylinder runabout and an 18-horsepower two-cylinder touring car. The two-cylinder car has its horizontal-opposed motor located in front.

As the foremost exponent of that Western school of automobile design, which contends that there is too much good to be found in the best horse vehicle practice to make it desirable to eliminate such advantages too absolutely, as is commonly the case, the Holsman car, of Chicago, Ill., attracts considerable attention. The rear wheels are 48 inches in diameter and the front wheels 44 inches in diameter, the wheelbase being 76 inches and the tread 56 inches. The large wheel diameter insures an extraordinary ability to cope with the bad roads, more common in the West than in the East, but sufficiently numerous in the less settled districts of that section of the country.

The Pungs-Finch line for 1907 includes four models, a 45-horsepower, a 30-horsepower runabout and a 40-horsepower touring car. No radical changes have been attempted, but there has been considerable refinement of details along the established lines of approved practice, with the result of making these cars more than ever satisfactory.

Good construction along sound rather than standard lines is the usual practice of the Duryea people, but this year there is a thoroughgoing novelty in the way of a rotary valve applied to a gasoline engine. The rotary valve avoids many of the objections that have been urged against similar valves by the expedient of adjusting through springing together the cylinder casting around it, all of which detail is carried out in a thoroughly workmanlike manner. The valve for all the three-cylinder engines consists simply of a single rotating piece, cooled by the passage of water through each hollow center and driven by a silent chain.

WHITE STEAMERS FILL A LARGE CORNER OF THE HALL.

Even the younger generation finds special provision made for it at the modern automobile show. The American Juvenile Electric, selling at $450, proves a point of interest that the average youngster finds it difficult to pass. This interesting little car has 20-inch wheels, with cushion tires, a wheelbase of 41 inches and a tread of 29 inches, a capacity, at one charge of the battery, of 20 miles; its weight is 350 pounds.

The 1907 Reo line includes the runabout and touring car of previous seasons, retaining the general construction that has made them so popular, but modified in a number of minor respects.

Alongside of the Reo, and handled by the same Eastern selling agents, R. M. Owen & Co., are the 1907 water-cooled Premiers—a limousine, a touring car and a runabout. The latter is one of the most sightly vehicles of its class that has yet appeared, its lines seeming to catch the fancy of every one, and its price making it certainly one of the biggest values that is turned out for the money. A peculiar feature is made of the use of full-elliptic springs all around, the other details of the car following closely the lines of the best standard practice.

ONE OF THE LARGEST EXHIBITS IS OF MAXWELLS.

HERE IS WHERE THE AIR-COOLED MARMON REIGNED.

WHAT THE MANY NEWCOMERS PRESENT

A VIEW of the exhibits quickly leads the observer to the conclusion that the improvements in automobile mechanism continue to come at a rate insuring an abundance of novelty every year. Despite the prediction that this year's show would not be marked by such radical departures as were on view at several of the stands last year, numbers of the exhibitors have devices and developments to offer, in most cases apparently as meritorious as they are original.

Particular interest centers in the cars this year exhibited for the first time in New York City. Over a score come under this classification, some of them absolutely new, others foreign but not previously imported, and still others the product of Western manufacturers who have not seen fit to exhibit so far East in the past.

Craig-Toledo.—The Craig-Toledo car is one of the newcomers, made, however, by an old concern. The Craig Shipbuilding enterprises of Toledo are among the best-known around the Great Lakes, and it is obvious that the best talent to be secured by this substantial concern has been levied upon in developing the design of their self-propelled vehicle. No attempt is made to cater to the demand for a low-priced car, the finest of material being used and the price most evidently having been decided upon after the completion of the designing. Hess-Bright ball bearings are used throughout the transmission.

A very radical feature, apparently well thought out, is the use of a subframe for supporting the motor and transmission. This subframe is carried upon the rear axle and hinged in front to the forward cross member of the frame. By this construction the possibility of misalignment of the engine and driving means is done away with and even the use of a universal joint in the propeller shaft is avoided.

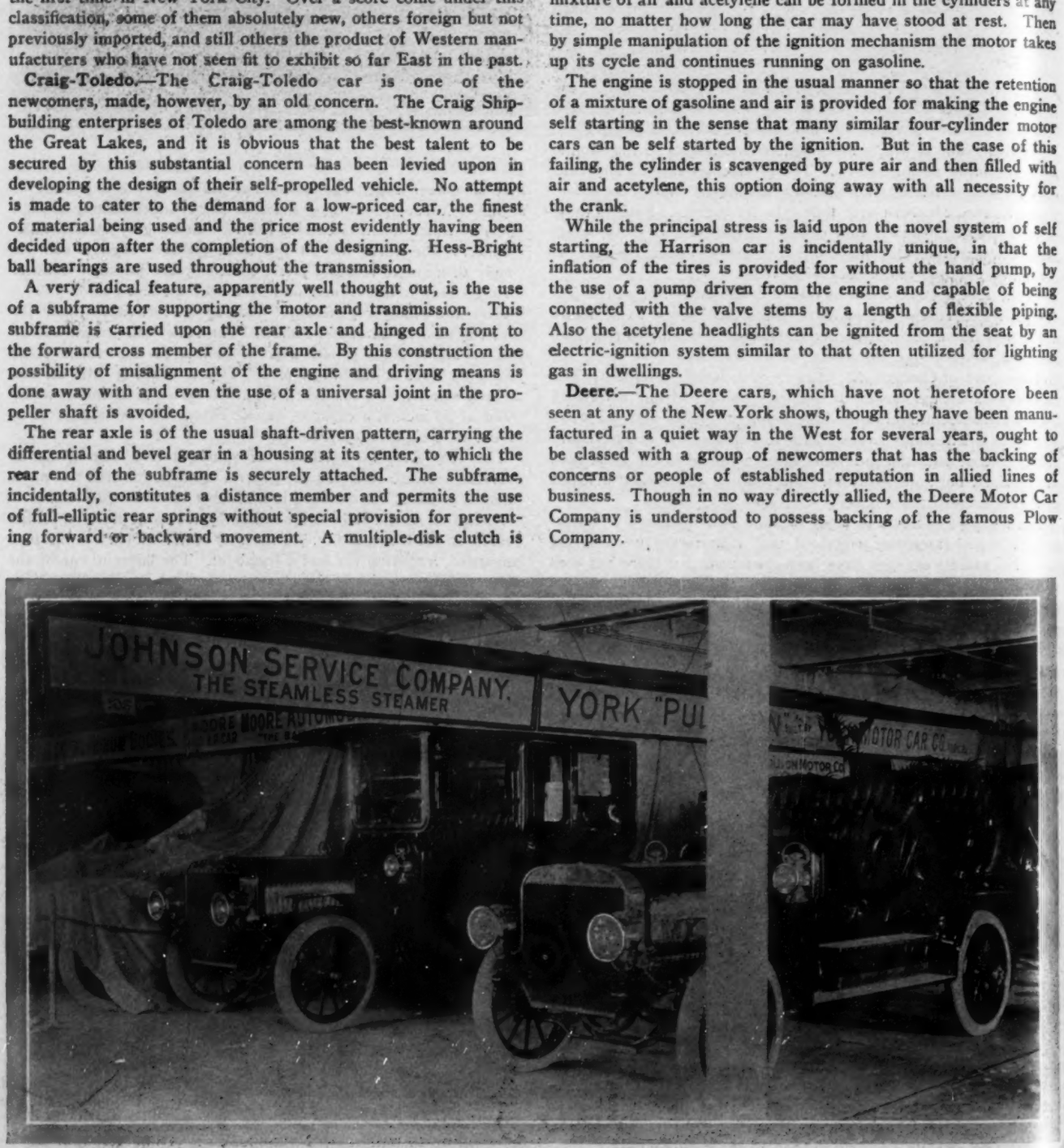
The rear axle is of the usual shaft-driven pattern, carrying the differential and bevel gear in a housing at its center, to which the rear end of the subframe is securely attached. The subframe, incidentally, constitutes a distance member and permits the use of full-elliptic rear springs without special provision for preventing forward or backward movement. A multiple-disk clutch is used with unusually numerous disks—52—alternately steel and brass, running in oil. Because of the unique construction, the engine normally stands at a slight downward slant towards the rear.

Harrison.—Another newcomer to attract special attention is the Harrison car, notable for the absolute elimination of the starting crank, invariable self starting from the seat being assured by the provision of an acetylene gas connection from the Prest-O-Lite tank to the engine cylinder, so that an explosive mixture of air and acetylene can be formed in the cylinders at any time, no matter how long the car may have stood at rest. Then by simple manipulation of the ignition mechanism the motor takes up its cycle and continues running on gasoline.

The engine is stopped in the usual manner so that the retention of a mixture of gasoline and air is provided for making the engine self starting in the sense that many similar four-cylinder motor cars can be self started by the ignition. But in the case of this failing, the cylinder is scavenged by pure air and then filled with air and acetylene, this option doing away with all necessity for the crank.

While the principal stress is laid upon the novel system of self starting, the Harrison car is incidentally unique, in that the inflation of the tires is provided for without the hand pump, by the use of a pump driven from the engine and capable of being connected with the valve stems by a length of flexible piping. Also the acetylene headlights can be ignited from the seat by an electric-ignition system similar to that often utilized for lighting gas in dwellings.

Deere.—The Deere cars, which have not heretofore been seen at any of the New York shows, though they have been manufactured in a quiet way in the West for several years, ought to be classed with a group of newcomers that has the backing of concerns or people of established reputation in allied lines of business. Though in no way directly allied, the Deere Motor Car Company is understood to possess backing of the famous Plow Company.



TWO MODELS OF THE JOHNSON STEAMER ARE SHOWN THIS YEAR IN THE SOUTHWEST CORNER OF THE GALLERY.

For the greater part the design is in accordance with the standards most universally accepted as being those of best practice and the construction that will interest the motor wise is the change-speed gear, at a casual glance resembling the usual sliding-gear system, affording three speeds forward and three reverse. It is, however, unusual in that the speed changes are made not by a sliding of the gears themselves but by locking them together by means of jaw clutches, so that the stresses of gear changing are distributed throughout circles of teeth instead of being taken entirely on one or two teeth, and those, ones that must carry the additional duty of normal driving.

Also of interest is the use of a spring element in the drive between the expanding clutch and change-speed gearbox. This consists of helical springs, held between two pairs of arms in such a manner that a range from 8 to 10 degrees of rotation is possible through the cushioning means along, thus relieving the transmission of the road shock that otherwise would be imposed upon it and greatly facilitating smooth starting. The motor is unusual in that it is exceptionally simple in appearance and not encumbered with the usual multitude of auxiliary devices.

Conover.—In the field of medium-priced touring cars or touring runabouts a substantial amount of business can be faithfully predicted for the new Conover car, now shown to the public the first time by the Watson Machine Company, Paterson, N. J. Possessed of the advantages that come with a large plant and a thorough factory organization, every detail of the car has been carefully considered and well worked out. The construction involves the usual four-cylinder, four-cycle motor in front, 4 1-2-inch bore and 5-inch stroke, developing 35-40 horsepower. An interlocking mechanism is used on the clutch and change-speed gear controlling means so that it is impossible to shift the gears when the clutch is engaged.

Frontenac.—One of the most likely looking newcomers is the Frontenac, made by the Abendroth & Root Manufacturing Company, of Newburgh, N. Y. This car appears in two principal models—a seven-passenger touring car and a three-passenger touring runabout of the type now so popular. The motor is the usual four-cycle, four-cylinder in front, water-cooled and driving through an expanding-ring clutch, through a sliding gear, affording three speeds forward and one reverse.

This concern stands committed to the use of standard annular bearings, claiming to find these, after two seasons' service, fully as efficient as similar bearings of foreign manufacture. Like many other newcomers into the automobile field, the concern back of the Frontenac is of established reputation in other lines, having manufactured the Root water-tube boiler, spiral riveted pipe and similar products for forty-five or fifty years.

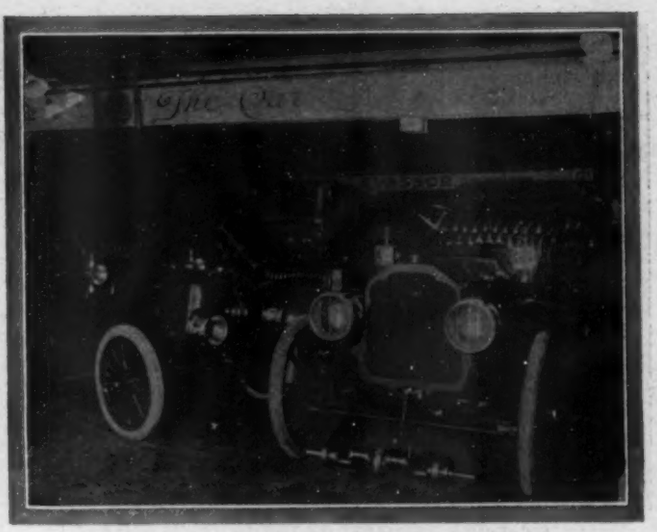
The American Mors is well represented by three touring cars, all of the well-known four-cylinder type, of 14, 24 and 40 horsepower, respectively. The difference between the three models that are shown is one of dimensions, the general design being along the lines followed by the Mors concern in their output heretofore. The American Mors is a duplicate of the French product of well-deserved fame.

American Napier.—Few of its present competitors would attempt to deny the Napier cars—the American Napier as well as the foreign—a full share of the credit for the prestige at present enjoyed by the six-cylinder idea. A very large six-cylinder car is the particular fixture of the Napier exhibit.

Dragon.—Of the Dragon car it is enough to say that it is the product of Leo Melanowski and Joe Tracy, whose prominence as automobile experts needs little attention. It is not radical, except in some of the minor details, and conforms generally to the general points of established practice.

Detroit.—The Detroit Auto Vehicle Company is one of the recent additions to the industry, and exhibits a 22-horsepower touring car with a double-opposed motor under the hood and otherwise of thoroughly standard lines.

Simplicity.—The Simplicity car, never before shown at a New York automobile show, is claimed by its manufacturer to be the "gearless car" of the future as well as of the present. Its price is rather above that of the average touring car, so it may be said to represent the first attempt of the friction drive to dispute the supremacy of the sliding gear, which so long has been regarded as the proper thing for luxurious, high-powered cars.



THE NEW DE LUXE MADE AN EFFECTIVE SHOWING.

The Great Smith car, with its odd-sounding but rather popular name, comes from Kansas City to New York for the first time, embodying a few ideas that suggest some interesting possibilities of the up-to-date automobile engineer. The most interesting feature is the single-lever controller of the sliding-gear type, the lever being so arranged that it automatically engages the multiple-disk clutch prior to dropping in the speed that is sought.

Moore.—Probably no car ever built has more careful hand and machine work expended on it than is expended upon the Moore. The built-up crankshaft, particularly, is worthy of note, as showing what really strong construction can be secured. One of the features of this car is the provision of three similar spark plugs, two in the opposite valve chambers being worked together by the magneto, while the central plug works from the battery reserve.

The Riviera is among the novelties, not only because of its newness, but because of its altogether unique spring suspension, combining the use of three-quarter platform and coil springs.

The Atlas Runabout, at $1,250, is one of the neatest appearing two-cylinder two-cycle vehicles of its class that ever have been produced. The motor is placed vertical in front, under the bonnet, and is water-cooled.

ANOTHER NEWCOMER, THE DRAGON, THAT SCORED.

A CAPABLE EXPONENT OF THE FRICTION DRIVE.

THE DETROIT SHOWED ITS CHASSIS PROMINENTLY.

THE STEAM CONTINGENT.

Besides the marked increase in power that characterizes the 1907 models of the White steamer, there are other changes in detail that in the aggregate constitute notable improvements.

The thermostatic regulation of the fuel, become almost a part of the White religion, has been displaced by the thermostatic regulation of the auxiliary water feed. The action of the new regulation system is to maintain the pressure at about 600 pounds to the square inch, whether the car is running fast or slow, or is climbing hills or going through heavy sand or mud. Another novelty is the superheater, consisting of a coiled pipe above the radiator so that the steam is perfectly dry as it reaches the engine. The armored wood frame is retained and reinforcing plates of nickel steel are used to give additional strength; besides this, a heavy bar connects the front spring horns. The new cars for 1907 are termed the Model G and Model H; besides these, the Model F is supplied at a different price.

The Johnson steamer, which was shown in New York for the first time last year, appears for the season of 1907 with few changes. The water-tube boiler previously used is retained and the four-cylinder single-acting steam engine with poppet valves is also retained. The burner is interesting because it is positively declared to be capable of burning kerosene successfully.

THE SPEED AT WHICH YOU TRAVEL.

Warner Instrument Company.—The Autometer, with its magnetic speed indicator and odometer attachment, is shown in operation in connection with the hemispherical vanes of an anemometer near the gallery ceiling, the current of hot air keeping the instrument in motion. A novelty this year is a bevel-gear connection by means of which the shaft may be brought up along the side of the car, where it is less liable to injury.

SOME MASSIVE GLIDES THAT HAIL FROM PEORIA, ILL.

Jones Speedometer.—Since last exhibited in this country this well-known instrument has won fresh honors abroad, being awarded the gold medal for an absolutely perfect record in the reliability test of the Automobile Club of Great Britain and Ireland this year. The instrument is shown in operation, mounted on a revolving wheel.

Winchester Speedodometer Company.—The speedodometer and odometer formerly known as the McGiehan, is shown in various styles. The old 60-mile dial has been replaced by one graduated to 75 miles to meet the increasing speeds of modern cars. A new bevel-gear connection is shown.

R. H. Smith Manufacturing Company.—The Springfield Motometer is shown in improved form, with or without odometer attachment; three instruments, geared to indicate speeds in the ratios of 1, 2, and 4, being driven by electric motor, the ratios remaining unaltered from the lowest to the highest speeds.

Veeder Manufacturing Company.—The exhibit of the Veeder specialties occupies a prominent corner of the main gallery. A large showcase is filled with the special forms of attachment for the many standard cars using this outfit. Two sections of dashes are also shown, with wheels running and odometers and tachometers in place and recording the varying speeds.

Oliver Instrument Company.—The index speed indicator, made by this company, is of the governor type, with odometer included in the same circular dial. The connection is made by a chain cut from tool steel, with universal joints between the links, making a very strong and durable "flexible shaft." The instrument is shown attached to a moving wheel, recording at both very slow and high speeds.

Hicks Speed Indicator Company.—The Hicks indicator is a combination of a speed indicator of the governor type with a Veeder odometer and a clock in the rectangular dial, giving speed, trip, and total mileage, and time. Three of the instruments are shown in position on a dash.

Lea Speedistimeter.—This instrument, made by the Motor Car Specialty Company, is shown in a new form, a Chelsea eight-day auto clock being incorporated as a part of the circular dial, the upper segment being graduated as a speed meter while trip and total mileage are also shown. In a simpler form the clock is omitted, the speed scale occupying the lower segment of the dial with the odometers above.

C. E. Lipman exhibits his line of circulating pumps and a new commutator. He also shows his speedmeter, which is operated by electricity, a small magneto generator on the front wheel furnishing the current.

THE CARS THAT CAME FROM ABROAD

By GEORGES DUPUY.

THE Seventh Annual of the Automobile Club of America is undoubtedly the most interesting of all the American automobile exhibitions held in the short history of the industry. Not only is the display of models and types larger than that of last year, but many new inventions, patents, ideas, important improvements on a great many parts of the chassis, positively mark the near approach of the era of the ideal vehicle. The Foreigners visibly realize that the "pace is fast" nowadays, and that this young country is rapidly getting to the front. In consequence, to keep up their splendid market, French, English, Germans, and Italians have shipped over the most perfect work they could possibly produce. Several new chassis, imported recently and practically unknown here, like the Dhain and the Delahaye, provoke sincere admiration and surprise among the connoisseurs for their simplification, neatness of steel work, strength and elegancy of all parts, joined to the power of an old reputation.

I saw a little man, Saturday afternoon, an old, white-haired, little man with a traveling cap, an ulster on his arm, and a faithful wife alongside of him, who, silently but inquisitively, was progressing from Renault to Delaunay Belleville, Mors to English Daimler, C. G. V., Panhard, and the rest of the European auto family.

"Look at that old chap," said young De Barres, to me, with a low voice and in the only pure French he knows. "Tell him that this is an AU-TO-MO-BILE! I bet you he never saw a piece of steel like that in his life, even on his brand new binder!"

"I don't think the old gentleman uses any such implements," replied I, "unless, possibly, he wants to pile up his greenbacks every once in a while. Now as far as his abilities to know a good piece of steel from a bad one are concerned, I think your old farmer is all right, for he is Andrew Carnegie, the steel king."

* * * *

Paul Lacroix, the active manager of the Renault Frères selling branch, welcomes me at his stand as one of the earliest visitors.

"How goes it, Paul?"

"All right," replies the young Frenchman. "The only thing that worries me is the question of knowing how I shall be able to effect my deliveries during the next three months. Every one of the cars exhibited here is sold a good many times over, and my next consignment of chassis and complete cars has not left the factory as yet."

He showed me a splendid 29-30-horsepower limousine by Kellner maroon verical stripes on Venetian black. The inside of the body is a silk corduroy of the most delightful effect, with ceiling matched, electric light throughout. The beautiful "voiture de ville" has just been sold to Stephen Palmer. Close to the limousine a long, roomy, 35-45 is exhibited. The touring body of red Arabian leather is signed Muhlbacher et Cie., Paris. All the Renaults of 1906 and 1907 are mounted on Michelin. Ignition by Simms-Bosh high-tension magneto.

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His jet black hair artistically combed, Mr. Neubauer, manager of the Delaunay Belleville, sits under the diffuse rays of a big arc lamp, his chair tilted back, in the attitude of a poet dreaming by the moonlight. He obstinately contemplates some distant object, over yonder, at the end of the hall. So intense is his revery that I decide to only have, on tip toes, a rapid inspection.

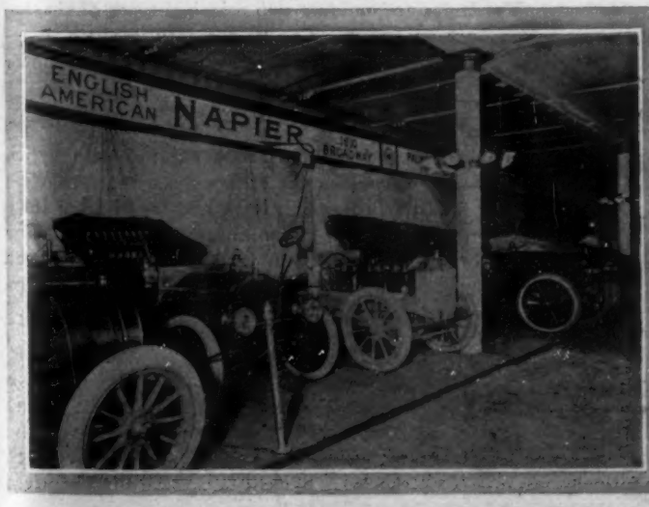
Here is a sturdy 40-horsepower chassis and a comfortable 20-horsepower limousine, cardan drive; also a double phaeton with large side entrance by Demarest. I do not notice, on the 40 chassis, any very radical change over last year's type, but the Delaunay Belleville was ever remarkable for its careful and intelligent construction which has made it a vehicle particularly fit for American roads.

* * * *

Mr. Dufresne, "an old-timer" in the importing field here, although quite a young man yet, is very busy explaining the beauties of the new 30-40 Westinghouse to an imposing group of connoisseurs. The excellent manufacturers of Le Havre, France, have, in fact, produced a real masterpiece for their 1907 model. The machine embodies all the chief qualities of the best foreign cars, to say nothing of its strikingly elegant lines. I notice the command of the centrifugal pump and the magneto, operated by the same gear, a beautifully casted motor with water jacket extending very low, thus insuring a perfect cooling, a clever device for protecting the ignition wires, the much-reduced gearcase, a new 36-disk clutch, and the excellent suspension.

* * * *

The C. G. V. Import Company exhibits a 14-18 landaulet by Demarest, a 30-35 chassis, and a 75-horsepower touring body which attracted much attention on the inauguration day of the show. The 75 C. G. V. constitutes, undoubtedly, one of the marvels of the automobile era. I have patiently examined the careful mounting of the three brakes, the workmanship of the semi-elliptical springs, and the least detail of the huge motor,



BOTH ENGLISH AND AMERICAN NAPIERS AT THIS STAND.

FORMIDABLE ARRAY OF C. G. Vs. IN MANY STYLES.

A CAR OF FAMOUS LINEAGE WITH AMERICAN NAME.

OF FRENCH BIRTH, BUT A HEALTHY AMERICAN.

with its four separate cylinders 150-140, the inlet valves in the heads, and the exhaust in the sideports. Ball bearings are used everywhere. The force-feed oiler is, this year, of a new system, covered by a patent. Everything in the chassis is supported on side members pressed with the main frame. I understand that, like the Renault agency, the C. G. V. are already sold out for a good many months.

* * * *

The 17-24 model of the French Mors, exhibited by Messrs. Cryder & Co., is extremely attractive. This little car really constitutes an ideal for town service, as it is noiseless, strong, supple, very economical, as well as capable of good speed when a spin into the country is desired. The car seats easily four persons. The chassis is especially established for cab or landaulet bodies, with a wheelbase of only 86 1-2 inches.

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E. R. Sutphen, assisted by his faithful lieutenant, "Fred" De Mar, exhibit three beautiful English Daimlers, one 28, one 30, and one 45 horsepower. The limousine and the touring body are signed Rothschild & Co., of New York. The young bodymaker has already made a great reputation for himself, as his work can rival that of the most famous Paris specialists, as far as quality and finish are concerned. The English Daimler 1907 model, compared with the 1906, is higher from the ground, and consequently freer from dust, yet is easier of access and egress. The engine itself has been raised from the frame, thus giving greater road clearance. The relative positions of the driving-shaft and countershaft have been reversed; the latter is now placed below the frame, with the result that the cross-shaft is carried much lower.

* * * *

André Massenat, the well-known manager of the Panhard in America, has a very interesting show, consisting of three 1907 models of the celebrated French make. I noticed an 18-horsepower chassis and a 24-limousine by Demarest, also a splendid 50-horsepower touring body. From 24 horsepower all the Panhard motors are fitted with a special system of extending cams allowing to diminish the compression to what is necessary for starting the motor, so making it very easy.

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Messrs. Palmer and Christie, agents for the Martini cars, are exhibiting a 28-32-horsepower touring body of 116-inch wheelbase. The engine is a remarkable piece of work, with its valves automatically commanded, on opposite sides, and its very neat casting. The carbureter of the Martini is classed as one of the best apparatuses of its kind, the exploding mixture being admitted according to the revolutions of the motor and the suction of the exhaust.

Delahaye et Compagnie, of Paris, are builders of one of the strongest cars made, and their twelve years of automobile construction is responsible for their well-established reputation throughout Europe for producing chassis par excellence, second to none. Robert de Barres, well known in Paris as an old motor-car driver and all-round sportsman, has introduced the Delahaye in the United States. Delahayes for 1907 are in three principal types: 24, 35, and 60 horsepower. The first model is shaft-driven, the others have special double chains. All shafts are nickel chrome steel, ball bearings throughout.

The De Barres Company is also an importer of the celebrated Pilain, a car destined to create a big sensation in this country. The chassis exhibited is a marvel of mechanism, precision, and finish. On the other hand, the Pilain is quite a conception in itself. The rear axle horizontally surrounding the differential, the level cardan shaft, the unique operating of the drumbrakes, the drop oiler incased in the dashboard, and, above all, the patented "air brake" acting on air and gas admission at the same time, constitute many features entirely new.

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E. B. Gallaher, the American representative of the Brasier, exhibits three cars, one 15-25, one 25-36, and one 50-60 horsepower. The 15-25 1907 is a very attractive little car.

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The Itala Import Company exhibits a 60-horsepower limousine by Demarest & Co., which attracted much attention on the first day by the beauty of its lines as well as its rich, roomy, comfortable body. The Italas are building two principal types of chassis, a 30-45 and a 60 horsepower. The 60-horsepower model especially constructed for American roads only weighs 2,800 pounds, with 126-inch wheelbase and 66-inch tread.

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The 1907 models of the Bianchi are being exhibited by S. Kieldsen. The factory in which these cars are manufactured is said to be one of the best equipped in Italy, and the King of Italy himself has a personal interest in the company's welfare. The design of the 1907 model includes no very radical changes over former models, but is built on the same general refined lines as are most of the cars imported from Italy.

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The Zust car is one of the youngest pupils of the great Italian school, but it has already made an enviable record in its home land. One of the most interesting features of the Zust is the construction of its frame, which is of sheet steel pressed into form by a special cold process. Bertelli & Co. are the importers of the car in America.

WHAT THE TIRE MAKERS HAVE TO OFFER

ONE of the most interesting studies at the show is watching the visitors at the various tire stands. If there be a skeptic on the subject of the desire for tires that can be removed without the past experiences of decided labor and accounted waste of time, then he ought to take his station at the tire displays of prominent makers. The interest shown is not of the curious, but of the earnest. That the makers have studied the situation in advance and to good purpose is best evidenced in the array of demonstrating stands that line the various aisles. While treads and construction come in for a share of public attention, he who runs may read the real demand.

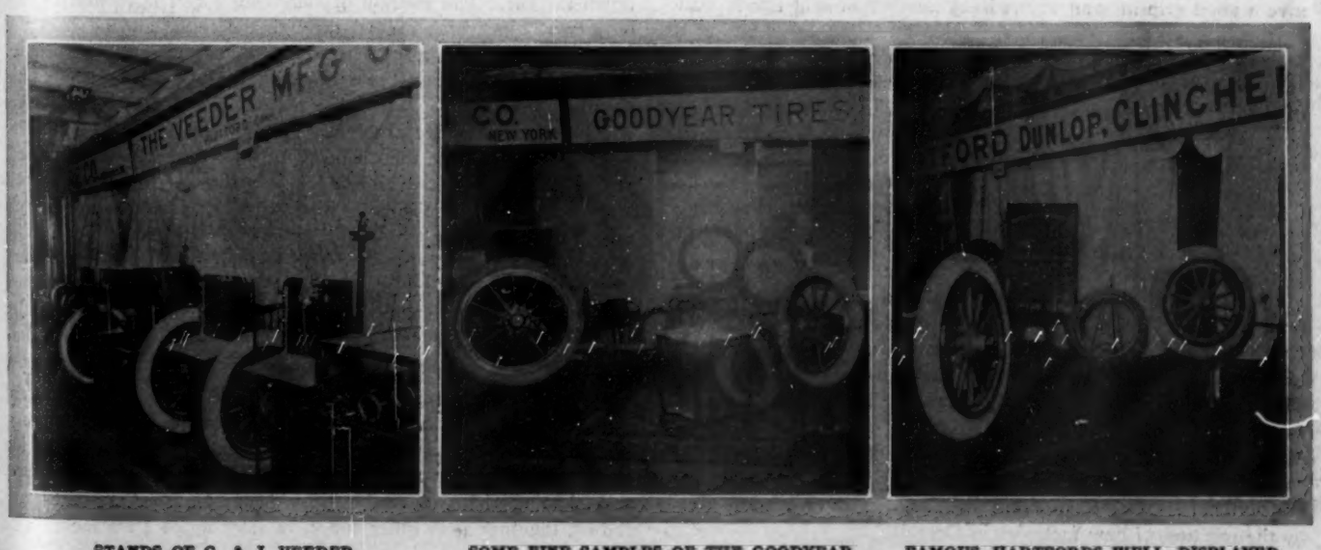
Hartford Rubber Works Co.—The universal rim for 1907 will take either clincher or Dunlop tires and has an improvement in its turnbuckle which controls the quick-attaching bead. The inner split ring retains the plain center turnbuckle of this year, as this ring rarely, if ever, needs removal. The outer split ring, however, the ring that does the trick, now has its right and left-threaded connecting piece worm threaded at its enlarged center. This central portion is in a two-pronged yoke, the dependent tang of which contains a worm which meshes with the above-mentioned worm, this tang projecting down through the beaded edge of the main rim. The center of this lower worm is broached with a square hole, into which is inserted the squared end of the shaft of a crank. It is obvious that merely turning the crank loosens or tightens the outer split ring for its removal or its replacement. The cheek of the crank is lengthened into a short prong for quickly snapping the ring out of place. The rings are so shaped that one side takes any clincher tire, while the reverse takes a Dunlop. A complete line of the Hartford product is shown.

B. F. Goodrich Company.—On this year's quick detachable retaining ring or bead for the standard clincher tire the small locking piece that went around the valve stem and then through the lug pocket has been discarded, as experience shows that its use was superfluous. The Goodrich ring is of the split type, with a sort of bayonet latch at each of the split meeting ends that are dropped into a common pocket. One end of the ring and its lug is first placed in the pocket, being positively located by a snub pin on the rim and a mere suspicion of a hole in the ring. The ring is then slipped into the depression running around the fixed portion of the rim. The pins on the tool ends are then put into holes in the ring ends, and the loose end of the ring brought into place with its lug dropping into the latch-and-lock pocket in the main rim. This rim accommodates only regular clincher tires, the bead on the opposite sid of the rim being a part of the main rim. The Goodrich clincher tires are made to be used on this rim without the need of casing lugs. The three exhibition stands are kept busy showing the ready operation of the rim device. The regular product of the company is also shown.

Diamond Rubber Company.—The Marsh rim which forms the attraction at the Diamond exhibit as regular put out is for standard clincher casings. It has the advantage that it can also be used for Dunlop tires by the use of a different set of rings. The main rim has its inside edge turned up to form a side stop, while its outside edge is turned down to form a lip for the split ring that locks in place. Against the inside stop is placed an endless ring with its cross section shaped according to the type of tire used. A corresponding endless ring is placed along the outer edge—after the tire is in place—and retaining this in place is a U-shaped split ring with its outer leg longer than its inner leg. This is an expanding ring, which seats itself around the down lip of the main rim, the long outer leg acting as a retaining ring for the endless ring on this side of the casing. The meeting ends of the split locking ring back off toward the base, giving a keystone opening into which is inserted a corresponding shaped wedge that slips over a bolt and there locked with a nut. In addition to this and the regular line of casings there is also shown a non-skid tire, or rather a non-skid tread, inasmuch as it can be applied to existing casings.

Continental Caoutchouc Company.—A new tire that commands the attention of the visitor who is interested at all in the subject is the Continental non-skid touring and racing tire. Deeply embedded in the gray rubber on the tread side is a thin strip of red rubber. Cushioned upon this rest the heads of the steel studs, which are disposed in four very regular rows around the periphery of the tire. The studs project through a lay of gray rubber, then through five plies of canvas impregnated with cement and compressed to a high degree of hardness and toughness which holds the rivets firmly. Over this is placed another strip of gray rubber, then two plies of fabric that extend half way down the edges of the tire, and then a final band of gray rubber, through all of which the studs pass. Two strips of very elastic red rubber are cemented on either side, after which the entire shoe is vulcanized. To prevent the heads of the studs cutting into the rubber, a square washer is placed under the head of each stud to rest upon the rubber tread. Besides this new tire the company is featuring its flat tread corrugation tires with fine circumferential corrugations.

G & J Tire Company.—All G & J tires are being made now with raised tread which is formed by vulcanizing an extra thickness of rubber onto the tread. Naturally this increases the life of the tire, while at the same time it adds to the resilience. The



STANDS OF G. & J. VEEDER SOME FINE SAMPLES OF THE GOODYEAR. FAMOUS HARTFORDS WELL DISPLAYED.

A FEW OF THE FORMIDABLE ARRAY OF TIRE AND IGNITION APPARATUS MANUFACTURERS' EXHIBITS THAT LINED THE GALLERY.

corrugated tread has been abandoned. The Indianapolis detachable Dunlop tire is being put out for the season with the Midgley detachable rim, which is used by a number of the largest tire makers. The improvement in this rim this year consists in forming the right and left threaded turnbuckle that draws the ends of the lockring together with a small skewgear, the teeth of which engage a worm fixed to the ring. This worm has a square socket into which fits a key attached to a small crank that is sold with the tires as a special detaching tool. Rotation of the tool in one direction or the other eightens or loosens the ring. The end of the tool opposite the crank-handle is brought down to an edge so that it can be inserted under the loosened ring and lift it up over the bead of the rim. The G & J people also manufacture motorcycle and bicycle tires.

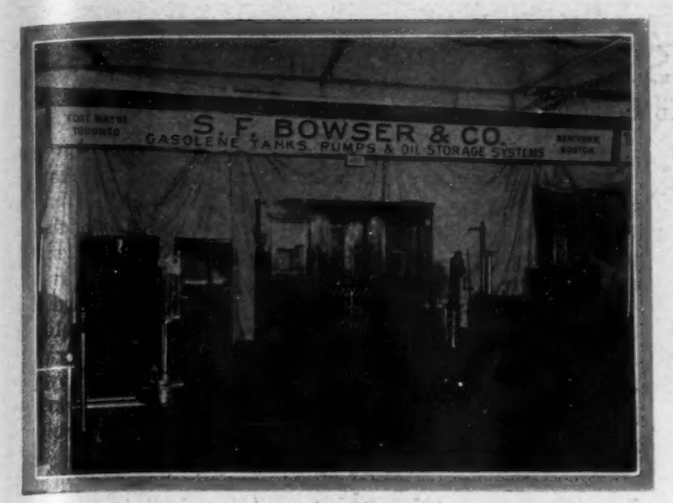
Goodyear Tire and Rubber Company.—Heavy Tourist Traction tires are new this year with this company, which has made a number of important changes in its line. The heavy traction tire is made with about half an inch of rubber on the tread, which is round and smooth, except that at intervals of three inches all around the circumference there are transverse grooves. These give a good grip in sand or mud. A heavy non-skid tire is made by the Goodyear people on these same lines, but in addition to the cross-grooves it has two parallel circumferential grooves of rectangular section which tend to prevent side-slip. A new form of detachable rim is also being shown. The retaining rings are now made hollow and non-reversible, to take Goodyear detachable and standard clincher tires, the rings being made in two forms for the two styles of tires. This same rim device has been applied to small sizes of solid tires.

Morgan & Wright.—Solid endless tires in all sizes for commercial vehicles are recent additions to the M. & W. line. They are molded with slightly convex tread and side, and have beads on the edges in which the retaining wires engage when on the rim. Cross wires, embedded at half-inch intervals, have their ends extending into the beads underneath the retaining wires. These tires can be used either single or in dual form. The pneumatic tires are fitted to Midgley quick-detachable rims. Although Morgan & Wright started late in the automobile tire game, they have made rapid progress and have greatly improved the quality of the tires and extended the line, and now the facilities have been doubled by the erection of new factories in Detroit.

Firestone Tire and Rubber Company.—This company has come out this year with a new clincher tire with wide beads and sharply-curved sides. These are made easy of attachment and detachment by means of the Safety Universal rim which, by means of two sets of split rings, takes any standard clincher or detachable tire. The ends of these flanges are drawn together to secure the rings in their grooves by means of a special tool having studs that engage in holes in the respective ends. When sufficiently tightened the ends of the rings are held together by similar studs. A full line of Firestone solid endless tires in single and dual types is shown with the regular sidewire fastening.

Pennsylvania Rubber Company.—Two new features are shown that hold the attention of those who stop in the anticipation of learning all that is latest in the quick handling of tires and in safety treads. The interest taken by visitors in tires that save time and effort when repairs become necessary is met by a new removable rim as the latest advance in this direction. The French method of loosening a multiplicity of nuts is done away with, cutting down the time needed for either removal or replacing to something like two minutes, including jacking up and letting down the car. The method of removing a rim is to first loosen only two bolts which extend through the felloe and bear on the clincher rim. The detachable section of the rim, along with its tire, is then turned on the felloe rim for about an inch. This disengages detents on the former from the slots on the latter, when the rim and tire are easily removed from the wheel. The new rim and tire are then slipped into place, the bolts tightened, and the entire operation finished in less time than it takes to tell the story. Non-skid tire construction has also had the company's attention in a casing that is distinctly built for the purpose. The several rows of steel studs are held at their base in several layers of fabric and then carried through the rubber tread where they are finally held from working loose by a tread strip of specially prepared leather. A new rubber inner tube with silk finish has also been brought out, fitted with American or French valves.

Ajax-Grieb Rubber Company.—An interesting demonstration of tire making draws crowds to the stand of this company. Near the aisle is mounted a heavy iron mandrel, before which stands a workman carefully laying on plies of rubber and fabric and shaping the tire ready for vulcanization. Ajax tires are shown, together with inner tubes, in sizes up to 4 1-2 inches and



A HOUSE OF ENVIABLE REPUTE WITH GARAGE OWNERS.

in wrapped and smooth tread. While there is nothing novel in the construction of the Ajax tires, evidence of the fact that superior material and workmanship enter into their construction is contained in the guarantee under which they are sold, covering the tires for 5,000 miles of use against blowouts and defects.

Electric Rubber Manufacturing Company.—This company advocates and is manufacturing for 1907 the Panther tire with a wrapped tread only. The reason given is that in vulcanizing molded tires it often happens that, under pressure in the mold, the fabric is squeezed out of alignment and forced up into the tread. In fact, the claim is made that molded tires have frequently been seen in which the fabric has been forced up to within one-eighth of an inch of the surface of the tread, and as a consequence the slightest wear on the tread uncovered the fabric, exposing it to sand and water, which soon destroyed its life and in most cases put the tire beyond repair. In addition to this there is shown the M. T. triple strength inner tube and the Traver blowout patch. This is made from twelve to fourteen inches long, of heavy fabric, rubber-coated, with a brass lip riveted to one edge to fit under the clincher bead of the rim. It will conform with the inside of all size casings, and is tapered with a soft rubber at its ends so as not to chafe inner tube.

Harburg Tire Company.—The feature of the exhibit is the Harburg detachable rim, which permits spare rims being carried with tires attached and inflated ready for use. There is permanently attached to the felloe a rim with six bolts fastened to prevent their falling out. The detachable rim will take any standard clincher, and has a base beveled inward to fit the correspondingly beveled permanent rim, the highest point of the bevel face being at the inner edge. The detachable rim is held in place by six hinged steel clips and nuts. The operation of tire changing is to first remove the four lower nuts and loosen the two upper. The detachable rim is then removed, the act of which folds back on their hinges the four freed clips, the two others remaining in position. The spare rim is then put on over the top clips and swung into place at the bottom. The four clips are then turned back and their nuts replaced. The Harburg tire is shown with a non-skid tread built into the rubber and fabric for retreading.

Arthur H. Middleton, Philadelphia, Pa.—The Hubbard patent tire for commercial vehicles was shown here. This tire has a series of comparatively small rubber blocks placed in rows, staggered; the blocks are set into recesses in the rim and are held in place by bolts passing through them radially, so that the heads, which are round, are outside and form a sort of studded tread. Thus the rubber is protected; but as the bolts have some freedom of motion the rubber can be compressed, giving the requisite elasticity. The bolt heads take all the hard work.

International A. & V. Tire Company.—New with this company is a quick detachable tire having reversible retaining rings to hold any standard clincher tire on one side and any detachable tire on the other. Oval clamping rings without mechanical fastening devices hold these retaining flanges in place, the rings engaging in grooves in the rims. The ends of the rings are beveled so that a screw driver or similar tool can be inserted under them to pry the ring out of the groove. Wrapped tread and Bailey-studded tread pneumatics are the styles shown.

Swinehart Clincher Tire and Rubber Company.—The latest form of Swinehart solid tire is the twin-tire for heavy commercial vehicles. This is simply a double Swinehart tire molded in one endless ring with transverse wires in the base engaging at their outer ends under the inturned edges of the rim and at their inner ends passing under a retaining wire extending through a slot in the middle of the base. A steel cable is tightened about the tire in the deep slot between the two single forms. The tread is corrugated. Samples are shown of tires used for eighteen months with 25,000 miles of service.

Michelin Products Selling Company.—Michelin non-skid tires of the kind the last Vanderbilt Cup race was won on are featured in the booth of this American-selling concern. The success of this tire is due to the fact that, besides employing rubber and other materials of the best quality, the manufacturers countersink the leather band, into which the steel studs are riveted, down into the rubber of the tread until their surfaces are flush with each other, and then vulcanize the strip into place. As a result, side strain does not tear the studded band off. Plies of canvas embedded in the rubber of the tire resist the thrust of the studs and prevent cutting down into the tire. The well-known Michelin corrugated flat-tread racing tires are shown in sizes up to probably the largest pneumatic tire in the show.

Fisk Rubber Company.—Three standards are used along the aisle of this space showing the mechanically fastened Fisk tire. The service this tire has given from its first appearance has been the keynote holding it to its construction without needed changes. The regular Fisk casing has the general appearance of a clincher tire with the beaded edges thicked. The wheel rim is absolutely flat. The casing rests in this, and is held in place by two rings, one on each side, resting in the tops of the beads. These rings are in turn secured to place by a number of large-headed cross bolts, which pass through the casing base, with a washer, corresponding to the bolt head and a nut. In addition to the well-known Fisk type of casing there is also made standard clincher casings.

St. John Rubber Tire and Manufacturing Company.—Cushion tires for automobiles and cycles are displayed, some attached to a car. The feature of the St. John tires is a series of short longitudinal slots molded clear through the tire at a point just above the rim. Narrow bridges or trusses are left between the ends of the slots to support the tread, the combination of slots and bridges contributing resilience.

A GREAT PURVEYOR OF SUNDRIES EXHIBITS HERE.

THE SPARK THAT STARTS THE MOTOR

By HAROLD H. BROWN.

PERHAPS the most notable feature brought out by the show is the gain in popularity of the magneto for ignition purposes on high-grade American cars. The single coil and distributer seem to be, to say the least, holding their own.

As to the use of storage batteries and dry cells, the situation remains much the same as last year, storage being used on the larger touring cars and dry cells being much more employed on the light touring cars and runabouts. The low-tension magneto does not seem to be gaining in use as rapidly.

The Dayton Electrical Company show their Apple charging system for 1907. In this system a small dynamo, whose speed is controlled by a governor, furnishes current for the ignition when the speed of the motor rises to the proper point. It also charges the ignition battery, which is simply used for starting. The operation of cutting out the dynamo when the speed drops is performed automatically. There have been several minor improvements to this system. The Dayton company also have a line of switches and a very neat charging plug by means of which an ignition battery can be readily charged from an ordinary lighting circuit.

The Witherbee Igniter Company show their line of ignition batteries of various sizes and patterns for different requirements. They also report that they have quite a call for batteries for the interior lighting of limousines.

The Elbridge Electrical Company show their ignition and lighting dynamo for automobiles and launches, also the Duro dry storage battery and a full line of electric lamps and fittings for autos.

The General Electric Company have a very interesting exhibit of Mercury Arc Rectifiers for charging storage batteries from alternating current circuits. They show a small machine built especially for charging ignition batteries and a large six-panel machine for garage use in vehicle charging. They also display a line of electric motors for automobiles.

The Eastern Carbon Company exhibit their well-known dry cells. This year, however, the company have brought out the Eastern gas engine cell, which has been adopted, as being especially suitable for gas engine work.

The National Carbon Company exhibit the Columbia dry cell in all the standard sizes as well as their reserve dry cell.

The American Electric Novelty Company have a line of the "Ever Ready" dry cells on exhibition in all sizes; also a very neat self-contained gauge light and an illuminated dashboard clock. They also show a hand calibrated volt ammeter.

Herz & Co. show a very complete line of ignition sundries, including their bougie Mercedes plug; also a line of French coils and batteries.

The Uncas Specialty Company exhibit a good line of timers and distributers. They show a special ball-bearing roller type of timer which is fitted with a supplementary ground connection for use on high speed motors.

The Connecticut Telephone and Electric Company show their regular line of coils and switches and ammeters, and also their coil testers. They have, in addition to their old line, however, brought out a timer and also a combined timer and distributer, both of which fairly bristle with new and good points.

The Autocoil Company show their line of multiple unit coils. This year they have brought out two novelties. One is their Ammeter Autocoil, in which the ammeter is always in circuit while the coil is in use and which reads by hundredths of an ampere to one ampere. The other is an ingenious foot-operated switch to change over from coil to magneto ignition.

The T. Alton Bemus Company show a line of their double ball timers, both singly and combined with their secondary distributers.

Heinz Electric Company.—One of the most interesting coil exhibits, both from the spectacular point of view and utilitarian, is that of the Heinz Electric Company. The most noticeable feature to the casual visitor is the demonstration board on which are mounted Geisler Vacuum tubes, spark gaps of various lengths and various pieces of apparatus for comparative tests of the merits of different coils. One very interesting thing on this board is a thermometer through which the spark from a coil could be switched and the comparative rise in rapidity of the temperature noted. Another is a so-called frequency indicator which shows in a very graphic manner the comparative rapidity of various vibrators. In the line of coils this company is making quite a number of special styles for various types of magnetos.

The Atwater Kent Company show their line of switches and ampermeters. They also show their so-called spark generator. This is nothing more nor less than a combined coil, distributer and timer mounted on the dash. The construction of the timer is, however, somewhat peculiar. It is operated by a system of springs and is so arranged that it gives the same time of contact at high or at low speeds, and in addition it is so arranged that it cannot by any possibility short-circuit the batteries with the switch closed.

Pittsfield Spark Coil Company.—Perhaps one of the greatest surprises in the ignition line to those who were not in the "know" was the appearance of the Pittsfield magneto, made by the Pittsfield Spark Coil Company. The workmanship is of the best and the design good and substantial. All the working parts are completely inclosed, but readily accessible, if need be, for inspection. The armature is mounted on Hess-Bright ball bearings. The machine is of that type having both the primary and secondary windings on the armature. The whole machine shows careful attention to minor details in its design and gives promise of good results. This company also show their regular line of coils and ignition equipment, which is practically unchanged.

C. F. Splitdorf Company.—This company show both high and low-tension magnetos. In the former case they are of the high-tension type, with both windings on the armature. For automobiles there is exhibited a complete combination coil and magneto system, including coil and switch. This company also show a line of lock switches operated by keys of the Yale type and also a new mica plug which contains some good structural points.

Lavalette & Co. have lately acquired the United States and Canadian patent rights of the Eiseman magneto. At this exhibit are shown magnetos suitable for the largest stationary engines down to those for single-cylinder motorcycles, as well as eight-cylinder cars. The Eiseman magneto, as is generally well known, is of that type which employs a separate coil or *transformateur*. The latest models of this magneto have several quite novel features. One of these is the advancing of the spark by rocking the magneto bodily about its armature, and the other is the employment of a grooved side cam which gives a positive motion to the circuit breaker lever. This machine is, perhaps, the best known in this country of any of the foreign magnetos.

Arc-Spark Manufacturing Company.—One of the neatest things in the spark plug line is the W. E. B. This plug has a peculiar contour and a knob of porcelain projects beyond the shell. This knob, of course, can be more readily cleaned than the ordinary plug, in which the insulator lies wholly below the shell. Below the shell the porcelain has a couple of corrugations, which tend to heighten the soot proof effect.

The McQuon Timer and Distributer is also on exhibition. This timer is of the type which gives the same time of contact for the spark regardless of engine speed and is used with a non-vibrator coil. If it is turned backwards the circuit will not be closed, and no matter what position the engine is left in the battery will not be short-circuited.

HOW THE ROAD AHEAD IS LIGHTED

By HOWARD GREENE.

Atwood Mfg. Co., Amesbury, Mass.—During the past year the entire line of lamps manufactured by this concern has been remodeled and many improvements introduced. The types shown include barrel- and bell-shaped gas headlights, square side lights and round side lights and tail lights, some of the gas lamps having brass beads projecting beyond the glass and some having beveled glasses projecting beyond the beading, the latter having a very attractive appearance. Searchlights are fitted with Mangin lens mirrors and with Bausch & Lomb lens mirrors. Two styles of acetylene generators are shown, one having a round body and the other a square body; both are water jacketed.

Badger Brass Manufacturing Company, Kenosha, Wis.—A complete line of the well-known Solar lamps is shown at this company's stand, including lights for every part of the automobile where a lamp is usually needed. Solar searchlights are made with Bausch & Lomb mirror lenses and are substantial in construction, no solder being used to make the joints. The Solar acetylene generators are made round, and the brass shells are without joint or weld.

R. E. Dietz & Co., New York.—At this stand were shown not only acetylene, oil, and electric lamps for automobiles, but also lamps that could be used interchangeably for any source of illumination by merely changing the burner attachments. Hinges and catches on all lamps have been made heavier and stronger, as well as neater in appearance. All the Dietz acetylene lamps are now of the barrel pattern. A new acetylene generator is shown, having a capacity of five pounds—three pounds more than the smaller type, which is also on exhibition. A particularly attractive square lamp—a type that is becoming very popular, especially for limousines and other closed machines—is shown. This is an oil lamp, but, like all the other Dietz oil lamps, can be used for acetylene or electricity by changing the burner attachments—a very simple matter.

Edmunds & Jones Manufacturing Company, Detroit, Mich.—Acetylene and oil lamps of all automobile patterns. The E. & J. acetylene lamps in the smaller sizes are made in barrel form, but the larger lamps are made with bell-shaped bodies spun from a single piece of heavy brass with securely riveted fastenings. A feature of these lamps is that all the lenses are recessed, a heavy bead projecting beyond the glass and protecting it to a great extent from accidental knocks. Some handsome bullet lamps are shown. The E. & J. acetylene generator is of the type in which the water and carbide chambers are in a cylindrical casing; this is turned when gas is wanted so that water can run into the carbide, and when gas is not needed any longer it is reversed, so that the carbide is above the water.

Gray & Davis, Amesbury, Mass.—Here are shown automobile lamps of all kinds, large and small, headlights to show the road far ahead, sidelights, and tail lamps. Also generators for use with these lamps and all necessary lamp fittings. This concern thoroughly understands what the automobilist wants, and is prepared to take care of these wants in a satisfactory manner.

C. T. Ham Manufacturing Company, Rochester, N. Y.—This concern manufactures high-grade oil lamps exclusively and shows a full line of its "cold blast" headlights, side lamps, and tail-lights. Among the new models is a very handsome square lamp which is designed to combine the beauty and elegance of French models with the illuminating power and other good qualities of the Ham lamps. A new tail lamp, the Monitor, is similar to the cold blast Vigilant tail lamp except that it is fitted with a new combination lens of the corrugated type. A safety locking device consists of a bracket with a groove cut in the prong and a key screwing through the socket on the lamp and catching in the groove, holding the lamp securely at any angle desired.

Rose Manufacturing Company, Philadelphia.—A comprehensive exhibit of the well-known Neverout lamps is shown at this stand, but perhaps the most interesting feature of the exhibit is the Neverout invertible safety gas producer which will supply sufficient gas for from one to four lamps. There is no gas under pressure, and no danger of explosion. The producer is mounted on trunnions in a heavy brass bracket, and when putting in water or carbide there is no necessity for removing the hose or tubing. A patent gas purifier is attached to the exterior of the producer. A very interesting feature is the use of carbide cartridges—metal cases of the right size and shape to insert in the producer and containing exactly the right quantity for a charge.

Manhattan Lamp Works, New York.—The Manhattan Lamp Works, having been unable to secure space at the show, but desiring to exhibit their product, found a splendid location at the Hotel Belmont, opposite the Grand Central Palace, where the show is being held. Here are shown samples of the very complete line of acetylene gas headlights, side lamps, and oil, tail, and side lamps of many patterns, the exhibit being a very complete one.

SOME REPRESENTATIVE LAMP EXHIBITS IN THE GALLERY WITH THE FISK TIRE EXHIBIT AS A CENTER SETTING.

CONCERNING WHEELS AND BEARINGS.

Timken Roller Bearing Axle Company, Canton, O.—The Timken Company has been busy evolving new features during the past season, and its exhibit shows many new forms of the tapered roller bearings for 1907; a special supplementary catalogue is devoted exclusively to these new features. Among the particularly interesting exhibits are the bearings worked out for steering pivots and for the steering gear, including thrust bearings for the steering gear and for the pivots, notably of the Lemoine type. This concern manufactures and exhibits a large variet yof axles and hubs, complete with driving gears, steering knuckles, and so on, making a particularly interesting collection to the manufacturer of automobiles.

Turner & Fish Company, Chicago.—This company exhibits a number of models of its Indestructible steel disk wheels suitable for automobiles of all classes, from light runabouts to heavy trucks. Hubs, rims, and tires of various standard makes are shown applied. Wheels are shown rotating at speeds representing various numbers of miles per hour, so that their appearance in actual use can be judged. The exhibit is an interesting one.

Hess-Bright Manufacturing Company, Philadelphia.—A very large and complete exhibit of the well-known Hess-Bright annular ball bearings is shown, in charge of Henry Hess. "We have nothing new," said Mr. Hess. "The only changes made are of a kind that do not usually come to the notice of the public—improvements in manufacturing processes. The quality of steel used has been improved, and the material is so hard that we have been forced to use our very best efforts to work it. But notwithstanding this, the most expensive part of the work of manufacturing our ball bearings is the inspection of the balls, for each ball is inspected and calibrated 22 times, and in the case of some bearings 28 times, by hand, in addition to the automatic mechanical measuring."

Hyatt Roller Bearing Company, Newark, N. J.—Front and rear axles, countershafts, hubs, transmissions, and other types of bearings were shown fitted with Hyatt flexible roller bearings of the spiral type, these bearings being used on a very large number of American automobiles. During the past year Hyatt bearings have been specialized and special forms have been adapted to various classes of work; the results are shown in the large exhibit. A new outer casing, or sleeve, for heavy duty, has been developed, and this is furnished when ordered. It is of steel and is finished accurately all over by grinding.

Schwarz Wheel Company, Philadelphia.—This exhibit consists of a collection of wood artillery wheels for automobiles, made on the Schwarz system, and of parts showing the method of putting the wheels together. The spokes are tongued and grooved in a peculiar way at their inner ends, and are put together one at a time under pressure, the whole set in each wheel being thus locked together solidly. So secure is this locking that no hub flanges are needed in manufacturing the wheel, the spokes holding firmly together and keeping the wheel true. The flanges need not be fitted until the wheel is actually to be put on its axle.

LUBRICATION IS A VITAL QUESTION.

A. W. Harris Oil Company.—This exhibit includes a large line of lubricants, both liquid and solid. A novel method is employed for demonstrating the qualities of the various lighter oils; each is fed to the bottom of a glass tube filled with water, arising in globules of uniform size and regular intervals. The oil is then allowed to escape in a slow stream down a shallow gutter in a sheet of tin, showing the evenness of its flow.

New York and New Jersey Lubricant Company.—A change-speed gear running in a glass case serves to show the quality of the non-fluid oils manufactured by this company; each gear is covered by a semi-liquid film of lubricant, adhering to the teeth and flowing smoothly into every interstice. This lubricant is not a grease, but a fine mineral oil, so treated as to maintain a certain consistency which alters but little with the weather.

THE TABULATION OF THE SHOW.

It is very apparent, upon anything more than the most casual consideration, that there is no more effective means of concisely and completely presenting the technical and other details of a group of automobiles than by a table.

Such tables have been compiled heretofore, but have lacked comprehensiveness, so, in deciding upon a table as the means to be used in the issue of THE AUTOMOBILE, for listing the features of the various cars now on exhibition at the Seventh Annual Show of the Automobile Club of America, it was readily concluded that no table at all would be better than an inadequate one—a feature to be strenuously avoided when undertaking a work as extensive in character as this is.

The average person who is interested in automobiles is far from satisfied upon being given merely price, weight, wheelbase, horsepower, carrying capacity, and a few other of the most obvious or easily ascertainable details. A genuinely intelligent interest seeks more. It calls for information on numerous finer points of construction, and requires facts concerning the materials, dimensions, etc., of a multitude of minor but essential particulars. And more than all these, it calls for the information arranged for convenient comparison, so that any given detail of one car can be readily referred to in connection with the similar or corresponding detail of some other car, of the same or of different type.

The table given on the following pages represents the most ambitious attempt ever made in the history of the industry, to compile exhaustive data, comparatively presented, concerning a large number of prominent cars. To present the same amount of information in any other form would require several times as much space, and then would lack the advantage of convenient cross reference.

To understand the table, and to avoid confusion, the parts of it on the successive pages are to be considered simply as one long table, each line clear across it being devoted to the details of one particular car, given by means of nearly two hundred entries. The headings and sub-headings over the entries indicate the specifications to which these refer. A clearer idea of the scheme of these headings will be gained by reference to the tabulation of headings given in the left column of the next page. In this tabulation it will be noted that there are six ranks of headings, though in the table proper the highest of these is left off or reduced to lower rank, to save space.

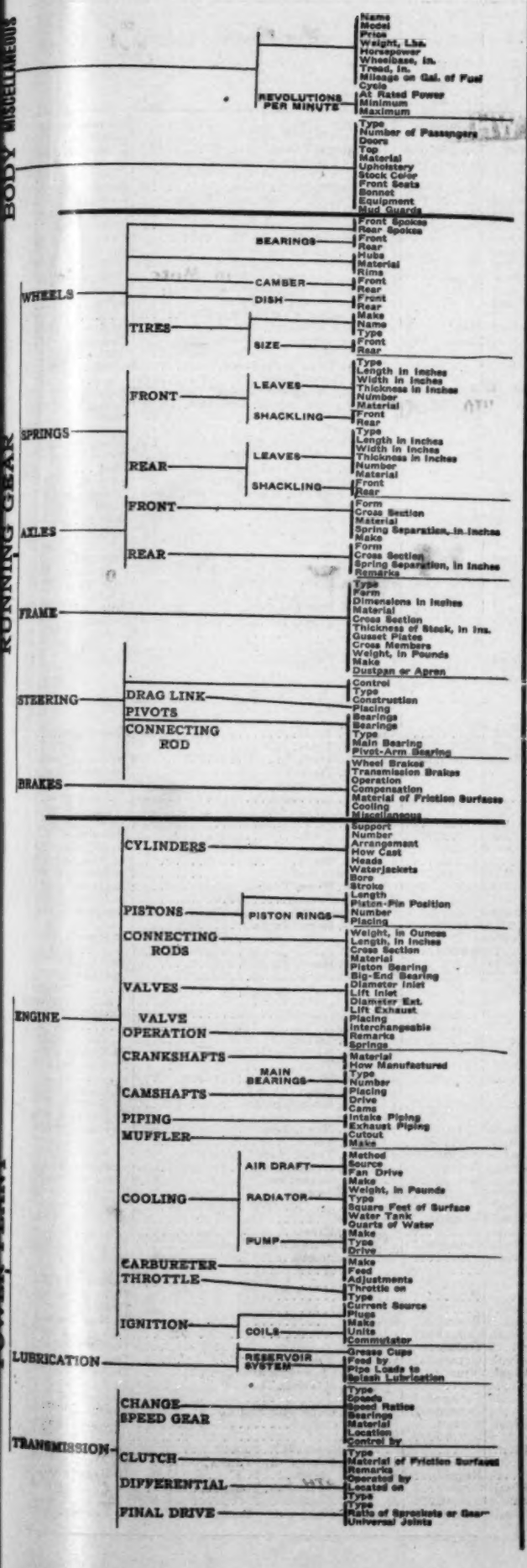
Though the utmost pains has been taken to insure the correctness and completeness of all the data, it is not impossible—because of the shortness of time and the amount of work involved in compiling—that a few errors may have crept in in addition to the occasional lack of information on certain cars under certain headings. Nevertheless, the substantial completeness of the table is obvious.

As for such errors as may exist we shall be pleased to have them corrected by any one interested enough to point them out, since it is possible that we may republish the table in some other form in the near future. Also, we wish here to express our thanks to the manufacturers whose ready response to a request for data has made this tabulation possible.

To those who wish to preserve the table for permanent reference a very good suggestion is that it be pasted up in one long line—about ten feet long—on a wall. By securing two copies of this issue of THE AUTOMOBILE both sides of each sheet can be had for pasting.

Cars, the names of which are marked by an asterisk (*), are steam cars, and those marked with a dagger (†) are electrics, so the data for these cars is not to be regarded as closely fitting the headings, where it has to do with the power plants.

The section of the table below the strip of white space relates to cars on which data was not secured until just before THE AUTOMOBILE went to press, and consequently is less complete than the first section. In both sections of the table the cars are arranged according to price, the lowest-priced at the top.



MISCELLANEOUS

Name	Model	Price	Weight, Lbs.	Horsepower	Wheelbase, In.	Tread In.	Mileage on Gal. of Fuel	Cycle	REVOLUTIONS PER MINUTE: At Rated Power	Minimum	Maximum
Ford	N	$500	1,000	15	84	56	25	Four	1,000	120	2,200
Holsman	2	650	800	10	75	56-62	25	Four	1,000	150	1,200
Maxwell	RL	825	1,150	14	72	56	18	Four	1,000	150	1,500
Logan	N	1,000	1,600	10	86	56	14	Four	1,200	300	1,600
Torbensen	T	1,400	.....	18	86	56	10	Four	1,000	300	1,200
Maxwell	HB	1,450	1,700	20	86	56	15	Four	1,000	100	1,600
Logan	O	1,500	1,600	20	86	56	18	Four	1,200	150	1,900
Dragon	LM	2,000	1,800	26	104	54	....	Four	1,200	120	1,800
Lambert	H	2,000	.....	35-40	105	56	....	Four	1,000	100	1,500
Premier	.....	2,250	2,100	24	110	56½	18	Four	1,100	120	2,900
Premier	.....	2,250	2,275	24	108½	56½	18	Four	1,100	120	2,600
Grout	1907	2,500	2,600	30-35	....	56	10	Four	.....	150	1,600
Dorris	B	2,500	2,300	30	102	56	15	Four	900	150	1,400
Smith	Q	2,500	2,448	24	107	56	15	Four	1,000	75	2,000
Lambert	G	2,500	.....	35-40	106	56	....	Four	1,000	100	1,500
Logan	M	2,500	3,750	30	108	56	8	Four	900	150	1,200
Marmon	C-7	2,500	2,150	24	96	56	18	Four	1,100	160	1,750
St. Louis	18	2,500	2,400	35	108	56	15	Four	1,200	120	1,650
Wayne	N	2,500	2,400	30-35	106	56	....	Four	1,200	.....	.....
Wayne	K	2,500	2,200	35	102	56	....	Four	.....	.....	.....
Atlas	C	2,600	3,500	30	102	56	8	Two	800	150	1,200
Pennsylvania	7	2,800	2,550	35	111	56	15	Four	1,000	100	2,000
Ford	K	2,800	2,600	40	120	56	....	Four	1,000	100	2,500
St. Louis	19	3,000	2,600	45-50	116	56	15	Four	1,200	120	1,800
Atlas	B	3,200	6,000	24	114	58	6	Four	300	160	600
American	.....	3,250	2,300	40	106	56	16	Four	1,000	120	1,300
American	.....	3,250	1,600	40	116	56	16	Four	1,000	120	1,300
Berkshire	D	3,500	2,800	35	118	56	....	Four	1,000	100	1,400
Commerce	17	3,500	4,000	30	109	56	10	Four	800	150	2,000
Marmon	F	3,500	2,850	35	104	56	14	Four	1,000	150	1,700
Wayne	R	3,500	2,800	50	117	56	....	Four	.....	.....	.....
Acme	16	.....	.....	50	102	56	28	Four	.....	.....	.....
Acme	XVIII	4,000	2,600	50	115½	56	15	Four	1,000	150	2,000
Craig-Toledo	.....	4,000	2,550	40	112	56½	....	Four	.....	.....	.....
Welch	G	4,200	3,000	50	129	56½	18	Four	1,200	82	2,000
Am. Mors	1907	5,000	.....	24-32	106	56½	14	Four	1,200	.....	.....
Harrison	C	5,000	3,000	40	123	54	18	Four	900	60	1,600
Am. Mors	1907	6,000	3,400	40-52	120	56½	12	Four	1,050	.....	.....
Welch	H	6,000	3,500	75	138	56½	18	Four	1,200	82	2,000
Am. Napier	.....	.....	4,000	60	126	56	11	Four	1,500	100	2,200
Westinghouse	1907	7,500	3,750	40	122	56	11	Four	1,000	100	1,600
Panhard	.....	.....	.....	.....	.....	.....	.....	Four	750	120	1,100
Panhard	.....	.....	.....	.....	.....	.....	.....	Four	750	120	1,150
Panhard	.....	.....	.....	.....	.....	.....	.....	Four	750	120	1,150
Mitchell	F	$2,000	2,300	35	108	562	15 g.	Four	.....	.....	.....
Mitchell	D	1,800	2,200	24	100	56	....	Four	.....	.....	.....
Pullman	E	1,800	.....	20	92	.....	.....	Four	.....	.....	.....
Frayer-Miller	1907	4,000	2,750	50	122	562	15 g.	Four	.....	.....	.....
Compound	M	1,600	16	16	962	.....	.....	.....	.....	.....	.....
Compound	L	1,800	1,600	20	962	.....	.....	.....	.....	.....	.....
Compound	X	2,000	1,750	20	962	.....	.....	.....	.....	.....	.....
Compound	J	1,400	1,400	16	84	.....	.....	.....	.....	.....	.....
Mitchell	E	1,600	1,600	20	90	56	....	Four	.....	.....	.....
Pullman	F	3,000	.....	40	110	.....	....	Four	.....	.....	.....
Pullman	G	3,500	.....	40	110	.....	....	Four	.....	.....	.....
Triumph	A	2,800	2,200	30	108	56	16 g.	Four	.....	.....	.....
National	L	5,000	.....	75	127	.....	20 g.	Four	.....	.....	.....
National	H	3,500	.....	50	112	.....	17 g.	Four	.....	.....	.....
National	F	3,000	.....	40	104	.....	17 g.	Four	.....	.....	.....
Detroit	G	1,500	1,800	22	96	56	....	Four	.....	.....	.....
Aerocar	F	2,750	2,700	40	.....	.....	20 g.	Four	.....	.....	.....
Craig-Toledo	1907	4,000	2,550	40	112	562	20 g.	Four	.....	.....	.....
Rainier	C	4,250	104	35	2400	.....	15 g.	Four	1,100	150	1,800
Cleveland	H	4,000	104	35	24	.....	15 g.	Four	1,000	.....	.....
Compound	I	2,250	1,750	20	962	.....	.....	.....	.....	.....	.....
Compound	H	3,750	2,500	40	115	.....	.....	.....	.....	.....	.....
Am. Mercedes	1907	7,500	.....	45	3279	mm.	....	.....	.....	.....	.....
B. L. M.	Pirate	3,500	1 300	24	98	.....	....	Four	.....	.....	.....
Moore	1907	6-8,000	3,300	40	166	.....	....	Four	.....	.....	.....
Lane	7-5	3,400	2,700	30	112	.....	....	Steam	.....	.....	.....
Lane	7	2,500	2,300	20	97	56	....	Steam	.....	.....	.....
Glide	G	2,500	2,500	36	120	56	18 g.	Four	.....	.....	.....
Glide	H	3,500	3,000	54	132	.....	.....	Four	.....	.....	.....
Glide	E	2,100	2,250	36	103	56	6 g.	Four	.....	.....	.....
White	G	.....	.....	30	115	.....	....	Steam	.....	.....	.....
Reo	1907	1,250	1,850	16-20	94	56	....	Four	.....	.....	.....
Reo	1907	675	1,000	8-10	78	56	....	Four	.....	.....	.....
Zust	1907	8,500	1,800	40	118	56	....	Four	1,100	....	1,300
Stoddard-D'ton	H	1,750	1,400	18	88	56	16	Four	1,200	100	1,800
Stoddard-D'ton	F	2,500	2,500	35	105	56	16	Four	1,000	90	1,700
Lansden	56	2,250	1,950	.....	90	56	.....	.....	.....	.....	.....
Johnson	1907	2,500	2,800	30	112	56	.....	.....	1,000	....	1,500
Martine	1907	7,000	7,000	28-32	....	56	....	Four	1,200	.....	.....
Amer. Truck	B	4,500	8,040	32-36	11 8	62	....	Four	900	....	1,200
Moon	G	3,500	2,600	30-35	110	56	....	Four	1,200	100	3,000
C. G. & V.	1907	6,500	.....	14-18	110	.....	10	Four	750	300	1 000
English Daimler	1907	8,500	2,850	45	114	55	....	Four	650	....	1,000
English Daimler	1907	7,500	2,850	35	114	55	....	Four	650	....	1,000
English Daimler	1907	6,500	2,850	30	114	55	....	Four	650	....	1,000
Delahaye	27	10,000	3,000	60	146	.....	....	Four	.....	.....	.....
Marion	7	2,000	1,825	22	100	56	....	Four	.....	600	1,200
Austin	1907	4,500	3,300	60	116	.....	....	Four	1,100	120	1,500
Carter-Car	A	1,350	1,600	20	94	.....	....	Four	.....	.....	.....
Moline	A	2,500	2,650	35	110	.....	....	Four	.....	.....	.....
Wood	1907	4,000	3,000	40	120	.....	....	Four	.....	.....	.....
Pungs-Finch	F	2,000	1,600	24	110	.....	.....	.....	.....	.....	.....
Pierce-Racine	D	2,600	.....	40	106	.....	....	Four	.....	.....	.....
Rambler	.....	1,000	.....	14	90	56	....	Two	.....	.....	.....
Crawford	E	2,000	.....	.....	106	.....	....	Four	.....	.....	.....
Berliet	.....	8,500	2,000	40	126	55	....	Four	900	200	1,300
Frontenac	C	3,500	2,800	.....	.....	.....	....	Four	900	.....	.....
Rambler	25	2,500	.....	35	112	56	....	Four	.....	.....	.....
Deere	A	2,500	2,500	30	110	56	....	.....	.....	.....	.....
Itala	1907	7,000	2,500	35	104	55	....	Four	900	150	1,300
Simplicity	.....	3,000	2,500	.....	.....	.....	....	Four	.....	.....	.....

THE BODY

Name	Type	Number of Passengers	Doors	Top	Material	Upholstery	Stock Color	Front Seats	Bonnet	Equipment	Mud Guards
Ford	Runabout	2		None	Wood	Leather	Maroon	Individual	Octagonal	Tools only	Plowshare
Holsman	Runabout	3		B'gy Top	Wood	Leather	Black		Square	2 Lamps, Horn, Tools	Leather
Maxwell	Runabout	2		None	Steel	Leather	Green	Optional	Half R'und	3 Oil Lamps, Tools	Metal
Logan	Commercial				Wood	Panta'te	Optional	Single	Round Top	2 Side, 1 Tail Lamp, Tools	
Torbensen	Commercial										
Maxwell	Touring	5	Side Ent'ce		Steel	Leather	Green	Single	Half R'und	3 Oil Lamps, Horn, Tools	Metal
Logan	Runabout	2		B'gy Top	Wood	Leather	Optional	Individual	Round Top	2 Side Lamps, 1 Tail Lamp, Tools	To Running B'd
Dragon	Touring	5	Side Ent'ce	Cape H'd	Wood	Leather	Blue	Individual	Pentagon	5 Lamps, Horn, Generator, Tools	To Running B'd
Lambert	Touring	5	Side Ent'ce	None	Wood	Leather	Verm'l'n	Individual	Round Top	5 Lamps, Generator, Tools	To Running B'd
Premier	Runabout	2			Wood	Leather		Individual		5 Lamps, Generator	To Running B'd
Premier	Touring	5	Side Ent'ce		Wood	Leather	Red	Individual		5 Lamps, Generator	Plowshare
Grout	Touring	5	Side Ent'ce	Cape H'd	Wood	Leather	Optional	Individual	Oval	4 Lamps, Generator, Top, T'ls, R'be R'l	To Running B'd
Dorris	Touring	5	Side Ent'ce	Cape H'd	Wood	Leather	Green	Individual	Oval	5 Lamps, Generator	To Running B'd
Smith	Touring	5	Side Ent'ce	None	Wood	Leather	Optional	Individual	H'f Oct'gon	Oil Lamps, Tools, Refrigerators, etc	Wheel Housing
Lambert	Touring	7	Side Ent'ce	None	Wood	Leather	Green	Individual		5 Lamps, Generator, Tools	Metal
Logan	Truck				Wood	Pant'ote	Optional	Single		2 Side Lamps, 1 Tail Lamp, Tools	
Marmon	Touring	4	Side Ent'ce	None	Al'm'um	Leather	Green	Individual	Oval	5 Lamps, Generator, Tools	To Running B'd
St. Louis		5	Side Ent'ce	None	Wood	Leather	Maroon	Individual	Round Top	5 Lamps, Generator, Tools, Horn	To Running B'd
Wayne	Touring	5	Side Ent'ce		Al'm'um	Leather	Carmine	Individual		5 Lamps, Horn, Tools, Generator	Metal
Wayne	Touring	5	Side Ent'ce		Wood	Leather	Black	Individual		5 Lamps, Generator, Tools	Metal
Atlas	Truck			Wagon	Wood		Yellow			Lamps, Horn, Tools	
Pennsylvania	Touring	5	Side Ent'ce	Cape H'd	Wood	Leather	Optional	Individual	Round Top	5 Lamps, Generator, Tools	Metal
Ford	Touring	7	Side Ent'ce	Cape H'd	Wood	Leather	Optional	Single	Half R'und	3 Lamps, Gas Lamps, Brackets, Tools	To Running B'd
St. Louis	Touring	7					Green	Individual	Round Top	5 Lamps, Tools, Generator	Plowshare
Atlas	Truck			Canvas	Wood	Leather	Yellow	Single		2 Lamps, Tools	
American	Runabout	2			Steel	Leather	Yellow	Individual	Round Top	2 Gas Lamps, Tail Lamp, Gen'ator, T'ls	Wheel Housing
American	Touring	5	Side Ent'ce	Cape H'd	Wood	Leather	Green	Individual	Round Top	5 Lamps, Generator, Tools	Wheel Housing
Berkshire	Touring	5	Side Ent'ce	None	Wood	Leather	Green	Individual		5 Lamps, Tank, Tools	Steel
Commerce	Truck			None	Wood	Leather	White	Single	None	Tools, Horn or Bell, 3 Lamps	None
Marmon	Touring	5	Side Ent'ce	None	Al'm'um	Leather	Green	Individual	Octagonal	5 L'ps, Pres'lite, S'k Absorbers, Tools	To Running B'd
Wayne	Touring	7	Side Ent'ce		Wood	Leather	Black	Individual		5 Lamps, Tools, Generator	Metal
Acme	Runabout	2			Wood	Leather	Brown	Individual	Round	5 Lamps, Tank, Tools	Steel
Acme	Touring	7	Side Ent'ce	Cape H'd	Wood	Leather	Green	Individual	Round	5 Lamps, Presto Tank, Tools	Steel
Craig Toledo	Runabout	3		None	Al'm'um						
Welch	Touring	7	Side Ent'ce	Optional	Wood	Leather	Optional	Individual		5 Lamps, Pres'lite Tank, Tools, etc	Optional
Am. Mors	Touring	7	Side Ent'ce		Wood	Leather	Optional	Individual	Square	5 Lamps, Gen'ator, Tools, H'n, S. Abs	To Running B'd
Harrison	Touring	7	Side Ent'ce	Cape H'd		Leather	Optional	Individual	D'ble R'nd	5 Lamps, Prestolite Tank, Tools	To Running B'd
Am. Mors	Touring	7	Side Ent'ce	Exten'on	Wood	Leather	Optional	Individual	Square	5 Lamps, Gen'ator, Tools, H'n, S. Abs	Steel
Welch	Optional	7	Side Ent'ce	Optional	Wood	Leather	Optional	Individual		5 Lamps, Pres'lite Tank, Tools, Etc	Optional
Am. Napier		7	Side Ent'ce	Cape H'd	Al'm'um	Leather	Green	Individual	Round	5 Lamps, Prestolite Tank, Tools	Plowshare
Westinghouse											
Panhard	Chassis										
Panhard	Limousine		Side Ent'ce		Wood	Cloth	Green	Individual	Square	5 Lamps, Generator	Wood
Panhard	Chassis										
Mitchell	Touring	5	Side Ent'ce				Blue			5 Lamps, Tools	Plowshare
Mitchell	Touring	5	Side Ent'ce	None				Individual		5 Lamps, Tools	Plowshare
Pullman	Touring	5	Side Ent'ce					Individual		5 Lamps, Tools	To Running B'd
Frayer-Miller	Touring	7	Side Ent'ce			Leather	R'dorB'k			5 Lamps, Tools	Frayer-Miller
Compound	Touring	5	Side Ent'ce								
Compound		2			A'm'um						
Compound	Touring	5	Side Ent'ce								
Compound	Stanhope	2			Al'm'um						
Mitchell		2					Blue	Individual		5 Lamps, Tools	Plowshare
Pullman	Touring	5	Side Ent'ce							5 Lamps, Tools	To Running B'd
Pullman	Touring	7	Side Ent'ce	Cape H'd						5 Lamps, Tools	To Running B'd
Triumph		3					Optional			Full Equipment	To Running B'd
National	Touring	7	Side Ent'ce		Al'm'um	Leather	Carmine	Individual		5 Lamps, Horn, Tools	To Running B'd
National	Touring	7	Side Ent'ce		Al'm'um	Leather	Carmine	Individual		Full Equipment	To Running B'd
National	Touring	5	Side Ent'ce		Al'm'um	Leather	Carmine	Individual		Full Equipment	Plowshare
Detroit	Touring	5	Side Ent'ce			Leather	Blue			5 Lamps, Horn, Tools	
Aerocar	Touring	5	Side Ent'ce								To Running B'd
Craig-Toledo		3			Al'm'um				Round		
Rainier	Touring	7	Side Ent'ce		Al'm'um	Leather	R'dorG'n			5 Lamps, Horn, Tools	To Running B'd
Cleveland	Touring	7		Cape H'd	Al'm'um					Complete	To Running B'd
Compound	Victoria	5	Side Ent'ce								
Compound	Touring	7	Side Ent'ce								
Am. Mercedes	Touring	7	Side Ent'ce		Wood	Leather	Optional				Plowshare
B. L. M.	Runabout	2									
Moore	Touring		Side Ent'ce		Al'm'um	Leather	Optional	Single		5 Lamps, Tools	
Lane	Touring	7	Side Ent'ce		Al'm'um	Leather	Optional			5 Lamps, Horn, Tools	To Running B'd
Lane	Touring	5	Side Ent'ce	Canopy	Al'm'um	Leather	Optional	Single		5 Lamps, Tools	To Running B'd
Glide	Touring	5	Side Ent'ce	None						5 Lamps, Horn, Tools	
Glide	Touring		Side Ent'ce	None						5 Lamps, Horn, Tools	
Glide	Touring	5	Side Ent'ce	None						5 Lamps, Horn, Tools	To Running B'd
White	Optional	7	Side Ent'ce			Leather	Optional			Complete	To Running B'd
Reo	Touring	5	Side Ent'ce		Wood	Pant'ote	Optional	Individual		5 Lamps, Horn, Tools	To Running B'd
Reo	Runabout	4	Fold'g Seat		Wood	Pant'ote	Optional	Individual		3 Lamps, Tools	
Zust	Touring	7	Side Ent'ce	Cape H'd	Wood	Leather	Optional	Optional	Round	5 Lamps, Tools, Horn	To Running B'd
Stoddard-D'ton	Runabout	2		Buggy	Wood	Leather	Optional	Optional	Round	5 Lamps, Generator	Enclosed Metal
Stoddard-D'ton	Tonneau	5	Side Ent'ce	Folding	Wood	Leather	Optional	Optional	Round	5 Lamps, Generator	Metal Enclosed
Lansden	Runabout	2		Cape H'd	Al'm'um	Leather	Optional			Full Equipment	Regular
Johnson	Touring	5	Side Ent'ce	None	Al'm'um		Optional	Individual		Regular	To Running B'd
Martine	Optional			Optional	Al'm'um	Leather	Optional	Individual	Round	Regular	
Am. Truck	Truck						Red			3 Lamps, Horn	
Moon	Optional	5		Optional	Al'm'um	Leather	Red	Individual	Octagonal	5 Lamps, Prest-O-lite Tank	To Running B'd
C. G. & V.	Optional		Side Ent'ce		Wood	Leather	Bord'ux	Individual		Full Equipment	To Running B'd
Mercedes											
English Daimler	Touring						Optional				To Running B'd
English Daimler	Touring					Leather	Optional				To Running B'd
English Daimler	Touring					Leather	Optional				To Running B'd
Delahaye	Limousine	9	Side Ent'ce		Wood	Leather	Optional	Optional	Round	Regular	To Running B'd
Marion	Runabout	2	Side Ent'ce	None	Wood	Leather	Optional	Individual	Octagonal	5 Lamps	To Running B'd
Austin		8	Side Ent'ce	None	Wood	Leather	White	Single	Square	5 Lamps	To Running B'd
Carter-Car	Touring Car		Side Ent'ce	Canopy	Wood	Leather		Individual	Octagonal	3 Lamps, Horn and Tools	To Running B'd
Moline	Limousine	5	Side Ent'ce	Canopy	Wood	Leather	Maroon	Individual	Square	5 Lamps, Generator and Tools	To Running B'd
Wood	Limousine	7	Side Ent'ce	Canopy	Wood	Leather	Red	Single		5 Lamps, P. Tank, Tools	To Running B'd
Pungs-Finch	Runabout	2	Side Ent'ce	None	Wood	Leather	Gray	Single	Octagonal		To Running B'd
Pierce-Racine	Touring Car			Canopy			Onyx	Single	Octagonal	5 Lamps, Generator and Tools	To Running B'd
Rambler	Runabout	2			Steel	Leather	Red	Individual	Round	Regular	To Running B'd
Crawford	Tourist	5			Steel	Leather				Regular	
Berliet	Limousine	7	Side Ent'ce		Wood	Leather	Optional	Individual		Extra Equipment	To Running B'd
Frontenac	Touring	7	Side Ent'ce	None	Wood	None	Optional		Octagonal	5 Lamps, Prest-O-lite Tank, Tools	To Running B'd
Rambler	Touring	5	Side Ent'ce		Steel	Leather	Red		Round	Regular	To Running B'd
Deere	Touring	7	Side Ent'ce		Wood	Leather		Individual	Square	5 Lamps, Generator, Tools	To Running B'd
Itala	Optional										
Simplicity	Touring		Side Ent'ce	Cape H'd	Wood	Leather	Optional	Individual	Octagonal	5 Lamps, Prest-O-lite Tank, Tools	To Running B'd

WHEELS

Name	Front Spokes	Rear Spokes	BEARINGS Front	BEARINGS Rear	Hubs	Material	Rims	CAMBER Front	CAMBER Rear	DISH Front	DISH Rear	Make	TIRES Name	TIRES Type	SIZE Front	SIZE Rear
Ford	12	12	Adjustable Ball	Hyatt Roller	Artillery	Hickory	Regular	Yes	No	Yes	No		Firestone	Solid	28 x 2½	28 x 2½
Holsman	14	16	Timken Roller	Timken Roller	Stag'red	Hickory	Regular	Yes	No	Yes	Yes	Sweet	Internat'al	Clincher	44 x 1½	48 x 1½
Maxwell			Adjustable Ball	Hyatt Roller	Artillery	Hickory	Standard			Yes	No		Swinehart	Solid		
Logan	12	16	Adjustable Ball	Hyatt Roller	Artillery	Hickory	Clincher			Yes	Yes	Logan	Firestone	Solid	30 x 3	30 x 3
Torbensen	12	12	Timken Roller	Timken Roller	Artillery	Hickory	Regular	Yes	Yes	No	No		Firestone	Solid	32 x 3	32 x 3½
Maxwell			Adjustable Ball	Hyatt Roller	Artillery	Hickory	Standard			Yes	No		Ajax	Clincher		
Logan	12	16	Adjustable Ball	Hyatt Roller	Artillery	Hickory	Clincher			Yes	Yes	Logan	M. & W.	Clincher	32 x 3½	32 x 3½
Dragon	12	12	Timken Roller	Hyatt & Ball	Artillery	Hickory	Clincher						Diamond	Clincher	32 x 3½	32 x 3½
Lambert	12	12	Timken Roller	Hyatt Roller	Artillery	Hickory				Yes	Yes				32 x 3½	32 x 3½
Premier	12	12	Adjustable Ball	Hyatt Roller	Artillery	Hickory	Regular	3°	No	No	No		Standard	Clincher	32 x 4	32 x 4
Premier	12	12	Adjustable Ball	Hyatt Roller	Artillery	Hickory	Regular	3°	No	No	No		Standard	Clincher	32 x 4	32 x 4
Grout	12	12	Adjustable Ball	Ball	Artillery	Hickory	Regular	Yes	Yes	No	No	Grout	Optional	Clincher	32 x 4	32 x 4
Dorris	12	12	Timken Roller	Timken Roller				No	No	No	No	Prudden	Optional	Clincher	32 x 4	32 x 4
Smith	12	12	Timken Roller	Timken Roller	Artillery	Hickory	Oak	Yes	No	Yes	Yes	Smith	Optional	Clincher	34 x 4	34 x 4
Lambert	12	12	Timken Roller	Timken Roller	Artillery	Hickory				Yes	Yes				32 x 4	32 x 4
Logan	12	12	Timken Roller	Timken Roller	Artillery	Hickory	Clincher			Yes	Yes	Logan	Swinehart	Solid	32 x 4½	32 x 4½
Marmon	12	12	Timken Roller	Hyatt Roller	Artillery	Wood	Regular	Yes	No	No	No	Schwarz	Optional	Clincher	32 x 4	32 x 4
St. Louis	12	12	Timken Roller	Timken Roller	Artillery	Hickory	Regular			Yes	No	Prudden	Fox	Clincher	32 x 4	32 x 4
Wayne	10	12	Adjustable Ball	Hyatt Roller	Artillery	Hickory	Detach'ble	Yes	No	Yes	Yes				34 x 3½	34 x 4
Wayne	12	12	Adjustable Ball	Cone	Artillery	Hickory	Detach'ble	Yes	No	Yes	Yes					
Atlas	14	14	Timken Roller	Timken Roller	Artillery	Hickory	Regular					Archibald	Diamond	Clincher	32 x 3½	32 x 4
Pennsylvania			Timken Roller	Timken Roller	Artillery	Hickory	Regular					Schwarz	Optional	Clincher	34 x 4	34 x 4
Ford	12	12	Standard	Hyatt Roller	Artillery	Hickory	Regular	Yes	No	Yes	Yes		Optional		34 x 4	34 x 4
St. Louis	12	12	Timken Roller	Timken Roller	Artillery	Hickory	Regular					Prudden	Fox		34 x 4½	34 x 4½
Atlas	14	14	Timken Roller	Timken Roller	Artillery	Hickory	Regular			No	No	Archibald	Diamond	Solid	36 x 5	36 x 6
American	10	12	Adjustable Ball	Cone	Artillery	Hickory	Clincher			Yes	Yes		G & J	Clincher	36 x 3½	36 x 4
American	10	12	Adjustable Ball	Cone	Artillery	Hickory	Clincher			Yes	Yes		G & J	Clincher	36 x 4	36 x 4
Berkshire			Hess-Bright	Hess-Bright	Artillery	Hickory	Clincher	Yes	Yes	Yes	Yes	Schwarz	Optional	Optional	36 x 3½	36 x 4½
Commerce	14	14	Timken Roller	Timken Roller	Artillery	Hickory	Regular	Yes	No	No	No	Timken	Diamond	Solid	32 x 4	36 x 5
Marmon	12	12	Timken Roller	Annular Ball	Artillery	Wood	Detach'ble	Yes	No	No	No	Schwarz	Optional	Clincher	34 x 4	34 x 4½
Wayne	14	14	Adjustable Ball	Ball	Artillery	Hickory	Detach'ble	Yes	No	Yes	Yes					
Acme	12	12	Timken Roller	Timken Roller	Artillery	Hickory	Regular	Yes	Yes	No	No	Schwarz	Optional		34 x 4	34 x 4
Acme	12	12	Timken Roller	Timken Roller	Artillery	Hickory	Regular	Yes	Yes	No	No	Schwarz	Optional		36 x 4	36 x 4½
Craig Toledo					Artillery										36 x 3½	36 x 4
Welch	14	14	Optional	Optional	Artillery	Hickory	Optional	Yes	No	No	No	Imperial	Optional	Clincher	36 x 4½	36 x 4½
Am. Mors	10	12	Hess-Bright	Hess-Bright	Artillery	Hickory	Regular	Yes	Yes	Yes	Yes	Sendelback	Optional	Clincher	36 x 4½	36 x 4½
Harrison	10	12	Standard	Annular Ball	Artillery	Hickory	Detachable	Yes	Yes	Yes	No	National	Diamond	Clincher	36 x 4½	36 x 4½
Am. Mors	10	12	Hess-Bright	Hess-Bright	Artillery		Regular			Yes	Yes	Sendelback	Optional	Clincher	34 x 5	34 x 5
Welch	14	14	Optional	Optional	Artillery	Hickory	Optional	Yes	No	No	No	Imperial	Optional	Clincher	36 x 5	36 x 5
Am. Napier	10	12	Hess-Bright	Hess-Bright	Artillery	Hickory	Regular	Yes	No	Yes	Yes		Optional	Clincher	915 x 105	920 x 120
Westinghouse			Hess-Bright	Hess-Bright		Hickory	Regular	Yes	No	No	No		Optional		915 x 105	935 x 135
Panhard	18	33	Malicet & Blin	Malicet & Blin	Artillery	Hickory	Regular						Continent'l	Clincher	36 x 5½	36 x 5½
Panhard	18	33	Malicet & Blin	Malicet & Blin	Artillery	Hickory	Regular						Continent'l	Clincher	36 x 4½	36 x 4½
Panhard	18	33	Malicet & Blin	Malicet & Blin	Artillery	Hickory	Regular						Continent'l	Clincher	36 x 4½	36 x 4½
Mitchell					Artillery	Hickory	Regular							De'h'ble	32 x 4	32 x 4
Mitchell	12	12			Artillery	Hickory	Regular							De'h'ble	32 x 4	32 x 4
Pullman	12	12	Timken Roller	Timken Roller	Artillery	Hickory	Regular	Yes	No	Yes	Yes				30 x 3½	30 x 3½
Prayer-Miller			Annular Ball	Annular Ball	Artillery	Hickory	Regular	Yes	No	Yes	Yes				36 x 4½	36 x 4½
Compound																
Compound																
Compound																
Compound																
Mitchell	12	12			Artillery	Hickory	Regular							De'h'ble	30 x 3½	30 x 3½
Pullman			Timken Roller	Timken Roller	Artillery	Hickory	Regular	Yes	No	Yes	Yes			Clincher	34 x 4	34 x 4½
Pullman			Timken Roller	Timken Roller	Artillery	Hickory	Regular	Yes	No	Yes	Yes				34 x 4	34 x 4½
Triumph	12	12	Ball	Ball	Artillery	Hickory	Regular	Yes		Yes	Yes			Clincher	36 x 3½	36 x 4
National	12	12	Annular Ball	Annular Ball	Artillery	Hickory	Regular	Yes	No	Yes	Yes			Clincher	36 x 5	36 x 5
National	12		Annular Ball	Annular Ball	Artillery	Hickory		Yes	No	Yes	Yes		D. or G & J	Clincher	34 x 4½	34 x 4½
National	12	12	Annular Ball	Annular Ball	Artillery	Hickory	Regular	Yes	No	Yes	Yes		D. or G & J	Clincher	32 x 4	32 x 4
Detroit			Am. Roller	Am. Roller	Artillery	Hickory	Regular	Yes	No	Yes	Yes			Clincher	32 x 3½	32 x 3½
Aerocar	12	12			Artillery	Hickory	Regular	Yes	No	Yes	Yes			Clincher	34 x 4	34 x 4
Craig-Toledo					Artillery	Hickory								Clincher	36 x 3½	36 x 4
Rainier			Annular Ball	Annular Ball	Artillery	Hickory	Regular	Yes	Yes	Yes	Yes			Clincher	34 x 4	34 x 4
Cleveland			Annular Ball	Annular Ball	Artillery	Hickory	Regular	Yes	No	Yes	Yes			Clincher	34 x 4	34 x 4½
Compound																
Compound																
Am. Mercedes	12	12	Hess-Bright	Hess-Bright	Artillery	Hickory	Regular	Yes	Yes	Yes		Schwarz	Continental	Clincher	910 x 100	920 x 120
B. L. M.	12	12	Hess-Bright	Hess-Bright	Artillery	Hickory	Det'able	Yes	No	Yes	Yes	Schwarz	Harburg	Clincher		
Moore			Hess-Bright	Hess-Bright	Artillery	Hickory		Yes	No	Yes	Yes		Contin'tal	Clincher	930 x 120	930 x 120
Lane			Timken Roller	Timken Roller	Artillery	Hickory	Regular						Optional	Clincher	36 x 4	36 x 4
Lane			Timken	Timken Roller	Artillery	Hickory	Regular						Optional	Clincher	32 x 4	32 x 4
Glide	12	12	Timken Roller	Timken Roller	Artillery	Hickory	Regular						Optional		34 x 4	34 x 4
Glide													Standard	Clincher	36 x 4½	36 x 4½
Glide			Annular Ball	Roller	Artillery	Hickory	Regular						Optional	Clincher	32 x 4	32 x 4
White					Artillery	Hickory	Regular								36 x 4	36 x 5
Reo	12	12	Timken Roller	Timken Roller	Artillery	Hickory	Regular		No					De'h'ble	30 x 3½	30 x 3½
Reo			Timken Roller	Timken Roller	Artillery	Hickory	Regular							De'h'ble	28 x 3	28 x 3
Zust			Hess-Bright	Hess-Bright	Artillery	Hickory	Regular	No	No				Michelin		870 x 90	875 x 105
Stoddard-D'ton	12	12	Timken	Timken	Artillery	Hickory	Det'h'ble	Yes	Yes	Yes	Yes	Salisbury	Goodrich	De'h'ble	30 x 3½	30 x 3½
Stoddard-D'ton	12	12	Timken	Timken	Artillery	Hickory	Det'h'ble	Yes	Yes	Yes	Yes	Salisbury	Goodrich	De'h'ble	34 x 4	34 x 4
Lansden			Hess-Bright	Hess-Bright	Artillery	Hickory	Regular	Yes	Yes				Optional		30 x 3½	30 x 3½
Johnson			Ball Adjustable		Artillery	Hickory	Det'h'ble		No				Goodyear		34 x 4	34 x 4
Martine			Hess-Bright	Hess-Bright	Artillery	Hickory	Regular	Yes	Yes				Contin'tal		875 x 105	875 x 105
Am. Truck			Roller	Timken	Artillery	Hickory	Regular						Optional		36 x 5	36 x 5
Moon	12		Ball Bearing	Annular Ball	Artillery	Hickory	Det'h'ble	Yes	Yes			Imperial	Optional		34 x 3½	34 x 4½
C. G. & V.	10	10	Hess-Bright	Hess-Bright	Artillery	Hickory	Regular					Rothschild	Michelin		815 x 105	920 x 120
Mercedes	12	12	D. W. & F.		Artillery	Hickory	Regular					Mercedes	Continent'l		910 x 100	920 x 125
English Daimler			Hess-Bright		Artillery	Hickory	Regular	Yes	No			Eng. D'ler	Optional		880 x 120	880 x 120
English Daimler			Hess-Bright		Artillery	Hickory	Regular	Yes	No			Eng. D'ler	Optional		880 x 120	880 x 120
English Daimler			Hess-Bright		Artillery	Hickory	Regular	Yes	No			Eng. D'ler	Optional		880 x 120	880 x 120
Delahaye			Hess-Bright		Artillery	Hickory	Regular						Optional			
Marion	12	12	Plain	Hyatt Roller	Artillery	Hickory	Regular					Own	Diamond	Clincher	32 x 3½	32 x 3½
Austin	12	12	Roller	Roller	Artillery	Hickory	Det'h'able	No							36 x 4	36 x 5
Carter-Car	12	12		Hyatt Roller	Artillery	Hickory							Diamond	Clincher	30 x 3½	30 x 3½
Moline	12	12			Artillery	Hickory	Regular						Goodyear	Clincher	34 x 4	34 x 4
Wood	12	12			Artillery	Hickory	Regular						Contin'tal	Clincher	36 x 4½	36 x 4½
Pungs-Finch					Artillery	Hickory	Regular						Optional		32 x 3½	32 x 3½
Pierce-Racine					Artillery	Hickory							Goodyear	Clincher	34 x 4½	34 x 4½
Rambler			Ball	Roller	Artillery	Hickory	Regular						Optional		30 x 3½	30 x 3½
Crawford					Artillery	Hickory	Regular								32 x 4	32 x 4
Berliet	12	12	Hess-Bright	Hess-Bright	Artillery	Hickory	Regular						Contin'tal	Clincher	36 x 4	36½ x 4½
Frontenac					Artillery	Hickory	Regular									
Rambler				Roller	Artillery	Hickory	Regular						Optional		34 x 4	34 x 4
Deere					Artillery	Hickory	Regular						Goodrich	Clincher	34 x 3½	34 x 4
Itala			Hess-Bright	Hess-Bright	Artillery	Hickory	Regular						Michelin	Clincher	870x90	80x120
Simplicity						Hickory	Regular							Clincher	34 x 4	34 x 4

SPRINGS

		FRONT							REAR							
		LEAVES					SHACKLING		LEAVES						SHACKLING	
Name	Type	Length in Inches	Width in Inches	Thickness in Inches	Number	Material	Front	Rear	Type	Length in Inches	Width in Inches	Thickness in Inches	Number	Material	Front	Rear
Ford	½ Elliptic	....	1¼	3/16	4	Alloy Steel	Normal	....	Full Elliptic	32	1½	3/16	3	Alloy Steel	Pivoted	Pivoted
Holsman	Full Elliptic	38	....	....	....	....	Pinned	Pinned	Full Elliptic	....	....	....	....	....	....	....
Maxwell	½ Elliptic	....	....	....	....	....	....	....	½ Elliptic	37	1¼	¼	5	Carbon Steel	....	....
Logan	Full Elliptic	34	1½	¼	5	....	....	....	Full Elliptic	36	1½	¼	5	Carbon Steel	....	....
Torbensen	Platform	36	1½	¼	5	Carbon Steel	....	....	Full Elliptic	36	2	....	8	Carbon Steel	....	....
Maxwell	....	36	2	....	6	Carbon Steel	....	....	½ Elliptic	36	1½	¼	4	Carbon Steel	....	....
Logan	½ Elliptic	55	1½	¼	5	Carbon Steel	Solid	Pinned	½ Elliptic	38	1½	¼	5	Carbon Steel	Pinned	Inverted
Dragon	½ Elliptic	38	1½	¼	5	Carbon Steel	Pinned	Inverted	Full Elliptic	38	2	½	10	Swedish Steel	None	None
Lambert	½ Elliptic	40	2	¼	7	Carbon Steel	Pinned	Pinned	Full Elliptic	38	1½	....	5	Alloy Steel	....	....
Premier	Full Elliptic	40	1½	¼	5	Alloy Steel	Normal	....	Full Elliptic	38	2	15/64	5	Carbon Steel	None	None
Premier	Full Elliptic	38	2	9/32	5	Carbon Steel	None	None	Full Elliptic	38	2	9/32	5	Carbon Steel	None	None
Grout	½ Elliptic	38	2	9/32	5	Carbon Steel	None	None	Full Elliptic	38	2	9/32	5	Carbon Steel	None	None
Dorris	....	42	2	¼	7	Spring Steel	Pinned	Pinned	½ Elliptic	42	2	¼	7	Special Steel	Pinned	Pinned
Smith	Full Elliptic	36	2	¼	5	....	Normal	Inverted	½ Elliptic	36	2	¼	5	....	Normal	Inverted
Lambert	½ Elliptic	36	1½	¼	7	Carbon Steel	None	None	Full Elliptic	36	1½	¼	7	Carbon Steel	None	None
Logan	Full Elliptic	40	1½	¼	5	Alloy Steel	Pinned	Inverted	Full Elliptic	40	½	....	5	Alloy Steel	....	....
Marmon	Full Elliptic	38	2½	¼	12	Carbon Steel	....	....	Platform	38	3	¼	12	Carbon Steel	Pinned	....
St. Louis	½ Elliptic	38	1½	....	6	Carbon Steel	....	....	Full Elliptic	40	1½	....	8	Carbon Steel	....	....
Wayne	½ Elliptic	42	2	¼	6	Alloy Steel	Riveted	Riveted	½ Elliptic	....	2	¼	8	....	....	....
Wayne	½ Elliptic	38	2	¼	6	....	....	....	½ Elliptic	50	2½	¼	7	....	....	....
Atlas	½ Elliptic	40	2	¼	....	....	....	....	½ Elliptic	50	2	¼	....	....	....	....
Pennsylvania	½ Elliptic	42	3	⅜	8	Carbon Steel	Pinned	Pinned	½ Elliptic	42	3	⅜	8	Carbon Steel	Pinned	Pinned
Ford	½ Elliptic	40	2	¼	6	Cruc. Steel	Inverted	....	Platform	....	2½	¼	8	Carbon Steel	....	....
St. Louis	½ Elliptic	....	....	....	....	Alloy Steel	Normal	Normal	Full Elliptic	....	....	....	....	Alloy Steel	....	....
Atlas	Full Elliptic	42	2	¼	8	Alloy Steel	....	....	Scr'l Elliptic	....	....	....	....	....	....	....
American	½ Elliptic	44	3	⅜	12	Carbon Steel	Pinned	Pinned	½ Elliptic	44	3	⅜	14	Carbon Steel	Pinned	Pinned
American	½ Elliptic	42	1½	....	6	Cruc. Steel	Shackled	Bolted	½ Elliptic	48	1½	....	7	Cruc. Steel	Bolted	Shackled
Berkshire	½ Elliptic	42½	2	....	6	Cruc. Steel	Bolted	Shackled	Platform	48	2	....	8	Cruc. Steel	Bolted	Shackled
Commerce	½ Elliptic	34	1⅜	¼	8	Carbon Steel	Pinned	Inverted	½ Elliptic	48	2	¼	10	Carbon Steel	Normal	Normal
Marmon	Full Elliptic	40	2½	5/16	9	....	Normal	Inverted	½ Elliptic	....	2½	5/16	12	Carbon Steel	Sliding	Cross
Wayne	½ Elliptic	38	2	....	5	Carbon Steel	Scr'l Ends	Scr'l Ends	Full Elliptic	42	2	....	7	Carbon Steel	Scr'l Ends	Scr'l Ends
Acme	½ Elliptic	40	2	....	6	....	....	....	½ Elliptic	60	2	....	11	....	....	....
Acme	½ Elliptic	42	2	¼	6	Carbon Steel	Normal	Normal	½ Elliptic	48	2	¼	9	Carbon Steel	Normal	Normal
Craig-Toledo	½ Elliptic	44	2	5/16	7	Carbon Steel	Normal	Normal	½ Elliptic	52	2	5/16	10	Carbon Steel	Normal	Normal
Welch	½ Elliptic	....	....	....	....	....	....	....	Full Elliptic	....	....	....	....	....	....	....
American Mors	½ Elliptic	45	2½	....	7	Carbon Steel	Pinned	Inverted	Full Elliptic	45	2½	....	8	Carbon Steel	Pinned	Pinned
Harrison	½ Elliptic	30½	2	....	8	Carbon Steel	Pinned	Inverted	Platform	38	2	....	3	Carbon Steel	Normal	Normal
American Mors	½ Elliptic	41	2	¼	6	Carbon Steel	Normal	Normal	½ Elliptic	48	2	¼	8	Carbon Steel	Normal	Normal
Welch	½ Elliptic	42	2	¼	7	....	Pinned	Pinned	Platform	38	2	¼	8	....	Normal	Normal
American Napier	½ Elliptic	45	2½	....	8	Carbon Steel	Pinned	Inverted	Full Elliptic	45	2½	....	8	Carbon Steel	Pinned	Pinned
Westinghouse	½ Elliptic	42	2	¼	9	Alloy Steel	Normal	Normal	Platform	48	2	¼	10	Alloy Steel	Pinned	Shackles
Panhard	Platform	48	....	....	8	Special Steel	Normal	....	½ Elliptic	....	....	....	10	Special Steel	Normal	Normal
Panhard	Platform	36	....	....	8	Carbon Steel	Riveted	Riveted	Platform	42	....	....	9	Carbon Steel	Riveted	Riveted
Panhard	Platform	36	....	....	7	Carbon Steel	Riveted	Riveted	Platform	42	....	....	8	Carbon Steel	Riveted	Riveted
Panhard	Platform	36	....	....	7	Carbon Steel	Riveted	Riveted	Platform	42	....	....	8	Carbon Steel	Riveted	Riveted
Mitchell	½ Elliptic	40	....	....	....	....	....	....	½ Elliptic	50	....	....	....	....	....	....
Mitchell	½ Elliptic	36	....	....	....	....	....	....	½ Elliptic	45	....	....	....	....	....	....
Pullman	½ Elliptic	....	....	....	....	....	....	....	½ Elliptic	....	....	....	....	....	....	....
Frayer-Miller	½ Elliptic	38	2	....	7	....	....	....	Full Elliptic	40	2½	....	7	....	Scroll	....
Compound	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Compound	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Compound	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Compound	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mitchell	½ Elliptic	40	....	....	....	....	....	....	½ Elliptic	42	....	....	....	....	....	....
Pullman	½ Elliptic	....	....	....	....	....	....	....	½ Elliptic	....	....	....	....	....	....	....
Pullman	½ Elliptic	....	....	....	....	....	....	....	½ Elliptic	....	....	....	....	....	....	....
Triumph	½ Elliptic	40	2	....	....	....	....	....	½ Elliptic	55	2	....	....	....	....	....
National	½ Elliptic	44	....	....	....	....	....	....	½ Elliptic	56	....	....	....	....	....	....
National	½ Elliptic	40	....	....	....	....	....	....	½ Elliptic	50	....	....	....	....	....	....
National	½ Elliptic	40	....	....	....	....	....	....	½ Elliptic	50	....	....	....	....	....	....
Detroit	½ Elliptic	....	....	....	....	....	....	....	½ Elliptic	....	....	....	....	....	....	....
Aerocar	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Craig-Toledo	½ Elliptic	....	....	....	....	....	....	....	Full Elliptic	....	....	....	....	....	....	....
Rainier	½ Elliptic	....	....	....	....	....	....	....	Platform	....	....	....	....	....	....	....
Cleveland	½ Elliptic	....	....	....	....	....	....	....	Platform	....	....	....	....	....	....	....
Compound	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Compound	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Am. Mercedes	½ Elliptic	....	....	....	6	Alloy Steel	....	....	½ Elliptic	....	....	....	10	Alloy Steel	....	....
B. L. M.	½ Elliptic	40	1½	¼	4	Alloy Steel	Pinned	Inverted	½ Elliptic	40	1½	¼	5	Alloy Steel	Inverted	Normal
Moore	½ Elliptic	....	....	....	....	....	....	....	Full Elliptic	....	....	....	....	....	....	....
Lane	½ Elliptic	....	....	....	....	....	....	....	½ Elliptic	....	....	....	....	....	....	....
Lane	½ Elliptic	....	....	....	....	....	....	....	½ Elliptic	....	....	....	....	....	....	....
Glide	½ Elliptic	....	....	....	....	....	....	....	½ Elliptic	....	....	....	....	....	....	....
Glide	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Glide	½ Elliptic	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
White	....	....	....	....	....	....	....	....	Full Elliptic	....	....	....	....	....	....	....
Reo	½ Elliptic	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Reo	½ Elliptic	....	....	....	....	Carbon Steel	....	....	Full Elliptic	....	....	....	....	....	....	....
Zust	½ Elliptic	....	....	....	8	....	....	....	Full Elliptic	....	....	....	....	Carbon Steel	....	....
Stoddard-Dayton	½ Elliptic	36	2	¼	3	Carbon Steel	Inverted	Inverted	½ Elliptic	....	....	....	8	....	....	....
Stoddard-Dayton	½ Elliptic	40	2	¼	6	Carbon Steel	Inverted	....	½ Elliptic	46	2	¼	4	Carbon Steel	Inverted	Inverted
Lansden	½ Elliptic	....	....	....	5	....	....	....	½ Elliptic	50	2	¼	7	Carbon Steel	Inverted	....
Johnson	½ Elliptic	....	....	....	7	Swedish	....	....	½ Elliptic	....	....	....	5	....	....	....
Martine	½ Elliptic	....	....	....	....	....	....	....	½ Elliptic	....	....	....	8	....	....	....
Am. Truck	½ Elliptic	....	....	....	21	Swedish St'l	....	....	Platform	....	....	....	....	....	....	....
Moon	½ Elliptic	....	....	....	6	....	Normal	Normal	Platform	....	....	....	....	Carbon Steel	....	....
C. G. & V.	Scroll	....	....	....	....	....	....	....	Full Elliptic	....	....	....	7	....	....	....
Mercedes	....	....	....	....	....	....	....	....	C. Type	....	....	....	....	....	....	....
English Daimler	½ Elliptic	....	....	....	9	Sp. Ger	....	....	....	....	....	....	....	....	....	....
English Daimler	½ Elliptic	....	....	....	....	C. N. Steel	....	....	Platform	....	....	....	....	C. N. Steel	....	....
English Daimler	½ Elliptic	....	....	....	....	C. N. Steel	....	....	Platform	....	....	....	....	C. N. Steel	....	....
Delahaye	½ Elliptic	....	....	....	....	C. N. Steel	....	....	Platform	....	....	....	....	Carbon Steel	....	....
Marion	½ Elliptic	40	1½	5	....	Crucible St'l	....	....	Platform	....	....	....	....	....	....	....
Austin	½ Elliptic	....	....	....	....	....	Normal	Normal	Full Elliptic	36	1½	....	5	Crucible Steel	Inverted	Linked
Carter-Car	Semi Elliptic	....	....	....	....	....	Normal	Normal	½ Elliptic	....	....	....	....	....	....	....
Moline	Crosswise	....	....	6	....	....	Inverted	Inverted	½ Elliptic	....	....	....	....	....	Normal	Normal
Wood	½ Elliptic	44	2	....	....	Carbon Steel	Pinned	Inverted	Full Elliptic	42	....	....	....	....	Inverted	Inverted
Pungs-Finch	½ Elliptic	....	....	....	....	Carbon Steel	....	....	½ Elliptic	48	2	....	....	Carbon Steel	Inverted	Inverted
Pierce-Racine	½ Elliptic	42	....	....	....	Carbon Steel	....	....	½ Elliptic	....	....	....	....	Carbon Steel	....	....
Rambler	Semi Elliptic	....	....	....	....	....	Double	Double	½ Elliptic	50	....	....	....	Carbon Steel	....	....
Crawford	....	42	....	....	....	....	....	....	Full Elliptic	....	....	....	....	....	Double	Double
Berliet	½ Elliptic	....	....	....	....	....	Normal	Normal	½ Elliptic	50	....	....	....	....	....	....
Frontenac	Semi Elliptic	42	....	....	....	....	....	....	Semi Ellip'c	....	....	....	....	....	Normal	Normal
Rambler	½ Elliptic	....	....	....	....	....	....	....	Full Elliptic	52	....	....	....	....	....	....
Deere	½ Elliptic	....	....	....	....	Carbon Steel	Normal	Normal	Full Elliptic	....	....	....	....	....	....	....
Itala	½ Elliptic	....	....	....	....	....	Pinned	Pinned	½ Elliptic	....	....	....	....	Carbon Steel	Normal	Normal
Simplicity	½ Elliptic	....	....	....	....	Carbon Steel	Normal	Normal	½ Elliptic	....	....	....	....	Carbon Steel	Normal	Normal

AXLES

	FRONT					REAR			
Name	Form	Cross Section	Material	Spring Separation, in Inches	Make	Form	Cross Section	Spring Separation, in Inches	Remarks
Ford	Straight	I-Section	Carbon Steel		Ford	Straight	Tubular		Wheels on Axle
Holsman	Straight	Square	Carbon Steel	34	Timken	Straight	Square	36	Solid
Maxwell	Straight	Tubular	Carbon Steel			Straight	Tubular		
Logan	Straight	Tubular	Carbon Steel	32½	Logan	Straight	Tubular	32½	Wheels on Axle
Torbenser	Dropped Center	I-Beam	Carbon Steel	35	Timken	Straight	Square	40	Wheel on Tube
Maxwell	Arched	Tubular	Carbon Steel			Straight	Tubular		
Logan	Dropped Center	Tubular	Carbon Steel	32½	Weston-Mott	Hassler	Tubular	32½	
Dragon	Dropped Center	Tubular			Dragon	Straight	Straight		Semi-Floating
Lambert	Dropped Center	Tubular	Carbon Steel	29		Straight	Tubular	29	Wheels on Axle
Premier	Dropped Center	I-Section	Carbon Steel	36	Premier			40	Built-up
Premier	Dropped Center	I-Section	Carbon Steel	36	Premier			40	Built-up
Grout	Dropped Center	Square	Special Steel	34	Grout	Straight	Square	34	Wheels on Axle
Dorris	Dropped Center	I-Section	Chrome-Nickel Steel	32½	Timken	Straight	Tubular	40	Wheels on Axle
Smith	Dropped Center	I-Section	Manganese Bronze	28½	Smith	Straight	Tubular	38½	Wheels on Axle
Lambert	Straight	Square	Carbon Steel	32½	Timken	Straight	Square	38	Wheels on Tube
Logan	Straight	I-Section	Carbon Steel		Timken	Straight	Square		Solid
Marmon	Dropped Center	I-Section	Carbon Steel	32	Marmon		Tubular	42	Wheels on Tube
St. Louis	Dropped Center	I-Section	Carbon Steel	32	Smith	Straight	Tubular	38	Wheels on Tube
Wayne	Dropped Center	Tubular				Straight	Tubular		
Wayne	Dropped Center	I-Section	Chrome-Nickel Steel			Straight			
Atlas	Dropped Center	I-Section	Carbon Steel		Timken	Straight	Tubular		Wheels on Axle
Pennsylvania	Dropped Center	I-Section			Timken	Straight	Tubular		Wheels on Axle
Ford	Straight	I-Section	Chrome-Nickel Steel		Ford	Straight	Tubular		Wheels on Axle
St. Louis	Dropped Center	I-Section	Carbon Steel	34	Timken	Dropped Center	I-Section	39	Wheels on Axle
Atlas	Straight	I-Section	Carbon Steel		Atlas	Straight	Tubular		Knox
American	Dropped Center	I-Section	Nickel Steel	30½		Straight	Tubular	40½	Floating Axle
American	Dropped Center	I-Section	Nickel Steel	32		Straight	Tubular	39½	Floating Axle
Berkshire	Dropped Center	I-Beam	Nickel Steel	36	Berkshire	Dropped Center	I-Beam	38½	Wheels on Tube
Commerce	Straight	I-Section	Timken	32	Timken	Straight	Square	37½	Dead Rear Axle
Marmon	Dropped Center	I-Section	Carbon Steel	32	Marmon		Tubular	42	Wheels on Tube
Wayne	Dropped Center	I-Section	Chrome-Nickel Steel			Straight			
Acme	Dropped Center	I-Section	Chrome Nickel Steel	31	Smith	Straight	Square		Wheels on Tube
Acme	Dropped Center	I-Section	Nickel Steel	31½	Smith	Straight	Square	40½	Wheels on Tube
Craig-Toledo									
Welch	Dropped Center	I-Section	Dropped Forging	27				40	
Am. Mors	Dropped Center	Oval	Chrome-Nickel Steel		Midvale	Dropped Center	Square		Wheels on Tube
Harrison	Dropped Center	Optional	Carbon Steel	32	Optional	Straight	Tubular	32	Wheels on Tube
Am. Mors	Dropped Center	Oval	Chrome-Nickel Steel	31		Dropped Center	Square	39½	Wheels on Tube
Welch	Dropped Center	I-Section	Dropped Forging	27				40	
Am. Napier	D opped Center	I-Section	Alloy Steel	32	Imported	Live Axle	Tubular	38	Semi-Floating
Westinghouse	Dropped Center	I-Section	Chrome-Nickel Steel		Lemoine	Dropped Center	I-Section		
Panhard	Dropped Center	Rectangle	Chrome-Nickel Steel		Lemoine	Straight	Rectangle		
Panhard	Dropped Center	Rectangle	Chrome-Nickel Steel		Lemoine	Straight	Rectangle		
Panhard	Dropped Center	Rectangle	Chrome-Nickel Steel			Straight	Rectangle		
Mitchell	Dropped Center					Straight	Tubular		Floating Axles.
Mitchell						Straight	Tubular		Floating Axles.
Pullman						Straight	Tubular		
Frayer-Miller		Tubular					Tubular		Floating Axles.
Compound									
Compound									
Compound									
Compound									
Mitchell	Dropped Center	Tubular				Straight	Tubular		Floating Axles
Pullman		Tubular					Tubular		Floating Axles
Pullman		Tubular					Tubular		Floating Axles
Triumph		I-Section	Nickel Steel			Straight	Tubular		Floating Axles
National		Tubular	Carbon Steel				Tubular		Floating Axles
National		Tubular				Straight	Tubular		Floating Axles
National		Tubular	Carbon Steel			Straight	Tubular		Floating Axles
Detroit			Chrome-Nickel Steel				Tubular		
Aerocar	Dropped Center	Tubular							
Craig-Toledo									
Rainier		I-Section	Nickel Steel						Floating Axles
Cleveland		I-Section	Nickel Steel						Floating Axles
Compound									
Compound									
Am. Mercedes	Dropped Center	I-Section	Chrome-Nickel Steel		Krupp	Straight	I-Section		Solid
B. L. M.	Dropped Center	I-Section	Chrome-Nickel Steel		Krupp	Straight	Tubular		Floating Axles
Moore	Dropped Center	I-Section	Chrome-Nickel Steel			Straight	Tubular		Floating Axles
Lane		Tubular					Tubular		Floating Axles
Lane		Tubular					Tubular		Floating Axles
Glide		I-Section							Floating Axles
Glide									
Glide									
White									
Reo	Straight	Tubular	Carbon Steel			Straight	Tubular		Floating Axles
Reo	Straight	Tubular	Carbon Steel			Straight	Tubular		Floating Axles
Zust	Dropped Center	I-Section				Dropped Center	I-Section		
Stoddard-Dayton	Dropped Center		Seamless		D. M. C.	Straight	Tubular		Floating Mem
Stoddard-Dayton	I. D. B. Center	I-Section	Carbon Steel	42	D. M. C.	Straight	Tubular	52	
Lansden	Straight	I-Section	C.-N. Steel			Straight	I-Section		
Johnson	Dropped Center	I-Section				Straight	Tubular		
Martine	Dropped Center	I-Section				Straight	I-Section		N. R. Axle
Am. Truck	Straight	I-Section	Carbon Steel		Timken	Straight	I-Section		
Moon	Dropped Center	I-Section				Straight	Tubular		Floating Mem
C. G. & V.	Dropped Center	Square	C.-N. Steel		Lemoine	Straight	Square		N. R. Axle
Mercedes	Dropped Center		Krupp		Mercedes	Straight	I-Section		N. R. Axle
English Daimler	Straight	I-Section	C.-N. Steel			Straight	I-Section		
English Daimler	Straight	I-Section	C.-N. Steel			Straight	I-Section		
English Daimler	Straight	I-Section	C.-N. Steel			Straight	I-Section		
Delahaye	Dropped Center	I-Section				Straight	I-Section		
Marion	Dropped Center	Tubular	Carbon Steel		Marion	Straight	Tubular		Floating Axles
Austin	Dropped Center	I-Section					Tubular		
Carter-Car	Straight	I-Section				Straight	Tubular		
Moline	Dropped Center	Tubular				Straight	Tubular		
Wood		I-Section				Dropped Center	Tubular		
Pungs-Finch		Tubular	Carbon Steel			Straight	Tubular		
Pierce-Racine	Straight	Tubular	Carbon Steel			Straight	Tubular		Floating Axles
Rambler	Straight	Tubular				Straight	Tubular		
Crawford									
Berliet	Dropped Center	Square	C.-N. Steel			Dropped Center	Square		Wheels on N.R.A.
Frontenac		I-Section					Tubular		
Rambler	Straight	Tubular		42		Dropped Center			
Deere	Dropped Center	I-Section	Carbon Steel			Straight	Tubular		
Itala	Dropped Center	Square	C.-N. Steel			Dropped Center	Square		Wheels on N.R.A.
Simplicity	Dropped Center	Tubular	Carbon Steel			Dropped Center	Tubular		

FRAME

Name	Type	Form	Dimensions in Inches	Material	Cross Section	Thickness of Stock, in Ins.	Gusset Plate	Cross Members	Weight in Pounds	Made	Dustpan or Apron
Ford	Pressed-Steel	Straight		Nickel Steel	Channel	1/8	Integral	Front and Rear		Smith	Steel
Holsman											
Maxwell	Pressed-Steel	Straight		Special Steel	Channel		Riveted	Channel			
Logan	Angle-Steel	Straight			Angle	1/4	Riveted	3, Angle Steel		Logan	None
Torbensen	Angle-Steel	Straight			Angle	1/5					
Maxwell	Pressed-Steel	Straight		Special Steel	Channel	5/32	Riveted	Channel			
Logan	Pressed-Steel	Straight		Special Steel	Channel	5/32	Integral	1 Drop, 2 Straight		Kinsey	Steel
Dragon	Pressed-Steel	Straight		Pressed Steel	Channel	3/8	Riveted	2 I-Beam, 2 Channel	75	Dragon	Sheet Iron
Lambert	Angle-Steel	Straight	118 x 27½	Angle Steel	Angle	1/4		4 Angles	90		Sheet Iron
Premier	Pressed-Steel	Cambered	118 x 34		Channel		Riveted	2 Channel, 1 I-Section		P. & B.	Steel
Premier	Pressed-Steel		122 x 34		Channel	5/32	Riveted	2 Channel, I-Section		P. & B.	Steel
Grout	Armoured W'od	Straight	128 x 36	Oak	Oblong	1/4		1 Channel		Grout	Steel
Dorris	Pressed-Steel	Straight	142		Channel	5/32	Riveted	1 Pressed, 1 Tubular	96	P. & B.	Gal. Iron
Smith	Wood	Straight		Ash	Rectanglar	2			83	Smith	Steel
Lambert	Angle-Steel		122 x 36	Angle Steel	Angle	1/4		2 Angle, 2 Castings	125		Sheet Iron
Logan	Angle-Steel	Straight			Angle	5/16	Riveted	4 Angle Bars		Logan	Steel
Marmon	Pressed-Steel	Straight		Carbon Steel	Channel	1/8	Riveted	1 Channel, 2 Tubes	105	Marmon	
St. Louis	Pressed-Steel	Straight	140 x 34	Carbon Steel	Inverted U	3/16	Integral	3 Channel	100	Kinsey	Steel
Wayne	Pressed-Steel	Straight	148½ x 32	Carbon Steel	Channel	3/16	Riveted	3 Channel			Steel
Wayne	Pressed-Steel	Straight		C. N. Steel	Channel	1/4		3 Channel			
Atlas	Channel Steel	Straight		Channel Steel				1 Casting, 1 Angle	150		None
Pennsylvania	Pressed-Steel	Straight	150 x 33		Channel	1/4	Riveted	3 Channel		P. & B.	Fibre
Ford	Pressed-Steel	Straight		C. N. Steel	Channel	3/14	Integral	Front and Rear Channel		P. & B.	Steel
St. Louis	Pressed-Steel	Straight	143 x 34	Carbon Steel	Inverted U					Smith	Steel
Atlas	Channel Steel	Straight	114	Channel Steel	I-Section	5/16			175		
American	Pressed-Steel	Cambered	145½ x 36	Carbon Steel	Channel	3/16	Integral	4 Channels	187		Yes
American	Pressed-Steel	Raised Rear	157½ x 34	Carbon Steel	Channel	3/16	Integral	3 Channel	180		Yes
Berkshire	Pressed-Steel	Cambered	157 x 36	Carbon Steel	Channel	3/16	Riveted	3 Channel	100	Smith	Steel
Commerce	Rolled-Steel	Cambered	161 x 39½	Carbon Steel	Channel		Riveted	5 Channel, 2 Other	300	Carnegie	Steel
Marmon	Pressed-Steel	Straight		Carbon Steel	Channel	1/8	Riveted	1 Tube, 1 Channel	115	P. & B.	Yes
Wayne	Pressed-Steel			C. N. Steel	Channel	3/16		4 Channel			Aluminum
Acme	Pressed-Steel			C. N. Steel	Channel	1/4	Riveted	3 Channel			Steel
Acme	Pressed-Steel			C. N. Steel	Channel	1/4	Riveted	3 Channel			Steel
Craig-Toledo	Pressed-Steel			C. N. Steel	Channel						
Welch	Pressed-Steel	Cambered	156 x 38		Channel	1/4		2 Angle, 1 Channel		Smith	Steel
Am. Mors	Pressed-Steel	Straight			Channel	1/4	Riveted	1 I-Beam, 4 Channel	230	P. & B.	Aluminum
Harrison	Pressed-Steel	Straight	150 x 34	Soft Steel	Channel	3/16	Riveted	3 Channel		Smith	Steel
Am. Mors	Pressed-Steel	Straight	146 x 36		Channel	1/4	Riveted	5 Channel	200	P. & B.	
Welch	Pressed-Steel	Cambered	151 x 38			1/4		2 Angle, 1 Channel		Smith	Steel
Am. Napier	Pressed-Steel	Straight	164 x 5		Channel	5/32		3 Channel		Imported	Aluminum
Westinghouse	Pressed-Steel	Cambered		C. N. Nickel	Channel		Riveted	4 Channel			Aluminum
Panhard	Wood	Straight		Oak	Inverted U					P. L.	Aluminum
Panhard	Wood	Straight	140 x 36	Oak	Inverted U					P. L.	Aluminum
Panhard	Wood	Straight	140 x 36	Oak	Inverted U					P. L.	Aluminum
Mitchell	Pressed-Steel			Carbon Steel	Channel						
Mitchell	Pressed-Steel			Carbon Steel	Channel						Metal
Pullman	Pressed Steel				Channel						
Frayer-Miller	Pressed-Steel				Channel						Metal
Compound	Pressed-Steel				Channel						
Compound	Pressed-Steel				Channel						
Compound	Pressed-Steel				Channel						
Compound											
Mitchell	Pressed-Steel				Channel						
Pullman	Pressed-Steel	Cambered		Steel	Channel						
Pullman	Pressed-Steel	Cambered		Steel							
Triumph	Pressed-Steel				Channel						
National	Pressed-Steel			Carbon Steel	Channel						Metal
National	Pressed-Steel				Channel						Metal
National	Pressed-Steel				Channel						Metal
Detroit	Pressed-Steel				Channel	5/32					
Aerocar	Pressed-Steel				Channel		Riveted				Steel
Craig-Toledo				Ch. N'l Steel							
Rainier	Pressed-Steel			Carbon Steel	Channel						Aluminum
Cleveland	Pressed-Steel				Channel						
Compound	Pressed-Steel				Channel						
Compound	Pressed-Steel				Channel						
Am. Mercedes	Pressed-Steel	Cambered		Carbon Steel	Inverted U		Riveted	Three Channel			Aluminum
B. L. M.	Pressed-Steel	Raised Rear		Ch. N'l Steel	Inverted U	1/8		2 Perm, 1 Bolted		Krupp	Aluminum
Moore	Pressed-Steel			Nickel Steel	Channel						
Lane	Steel				Angle						
Lane	Steel				Angle						
Glide	Pressed-Steel				Channel						
Glide											
Glide	Wood				Channel						
White											
Reo	Pressed-Steel				Channel						Fiber
Reo	Angle	Straight		Steel	Angle						Fiber
Zust	Pressed-Steel	Cambered		Steel	Channel						Aluminum
Stoddard-Dayton	Pressed-Steel	Straight		Hot R'l'd St'l	Channel	3/16	Integral	3-Pressed Steel	120	D.M.C.Co.	Metal
Stoddard-Dayton	Pressed-Steel	Straight		Carbon Steel	Channel	3/16	Integral	Pressed Steel	142	D.M.C.Co.	Steel
Lansden	Wood	Straight		Ash							
Johnson	Pressed Steel	Straight			Channel						None
Martine	Pressed-Steel	Cambered		Ch. N'l Steel	Channel						Steel
Am. Truck	Steel	Straight		Steel	Channel		Riveted				None
Moon	Pressed-Steel	Straight		Steel	Channel					P. & B.	Steel
C. G. & V.	Steel Tube	Straight									Steel
Mercedes	Pressed-Steel	Straight		Krupp Steel						Mercedes	Aluminum
English Daimler	Pressed-Steel	Straight		Ch. N'l Steel	Channel						Steel
English Daimler	Pressed Steel	Straight		Ch. N'l Steel	Channel						Steel
English Daimler	Pressed Steel	Straight		Ch. N'l Steel	Channel						Steel
Delahaye	Pressed-Steel	Cambered		Ch. N'l Steel	Channel		Riveted	3 Channel			Steel
Marion	Pressed-Steel	Straight		C. N. Steel	Channel		Riveted	Three	95	Smith	Steel
Austin	Pressed-Steel	Straight			Channel	1/4	Riveted	5-One Tube			None
Carter-Car	Pressed-Steel	Cambered		C. N. Steel	Channel	1/4	Integral	5-One Tube			Leather
Moline	Pressed-Steel	Straight		C. N. Steel	Channel						Aluminum
Wood	Pressed-Steel	Cambered		C. N. Steel	Channel	1/4	Riveted				Aluminum
Pungs-Finch	Pressed-Steel	Cambered		C. N. Steel	Channel		Integral				Aluminum
Pierce-Racine	Pressed-Steel	Cambered		C. N. Steel	Channel	1/4	Riveted				Steel
Rambler	Pressed-Steel	Straight			Channel		Riveted	2 Channel			None
Crawford											
Berliet	Pressed-Steel	Straight		Ch. N'l Steel	Angle		Integral				
Frontenac	Pressed-Steel										
Rambler	Pressed-Steel	Straight		Steel	Channel		Riveted				
Deere	Pressed-Steel	Straight									None
Itala	Pressed-Steel	Straight		Ch. N'l Steel	Channel		Integral				Aluminum
Simplicity	Pressed-Steel	Cambered		Ch. N'l Steel	Channel						None

STEERING

Name	Control	Type	Construction	DRAG LINK: Placing	DRAG LINK: Bearings	PIVOTS: Bearings	PIVOTS: Type	CONNECTING ROD: Main Bearing	CONNECTING ROD: Pitot-Arm Bearing
Ford	Wheel	Irreversible	Reduction Gears	Behind Axle	Ball-and-Socket	Plain	Elliott	Ball-and-Socket	Cross Shackle
Holsman	Lever		Direct	Behind Axle	Ball-and-Socket	Plain	Elliott	Ball-and-Socket	Ball-and-Socket
Maxwell	Wheel	Reversible	Rack-and-Pinion	Behind Axle	Ball-and-Socket	Plain		Ball-and-Socket	Ball-and-Socket
Logan	Wheel	Irreversible	Worm-and-Segment	Behind Axle	Pin	Plain	Lemoine Type	Ball-and-Socket	Cross Shackle
Torbensen	Wheel	W'm-&-S'r		Before Axle	Ball-and-Socket	Plain	Inverted Elliott	Ball-and-Socket	Ball-and-Socket
Maxwell	Wheel	Reversible	Rack-and-Pinion	Behind Axle	Ball-and-Socket	Plain		Ball-and-Socket	Ball-and-Socket
Logan	Wheel	Irreversible	Worm-and-Segment	Before Axle	Pin	Plain	Lemoine Type	Ball-and-Socket	Ball-and-Socket
Dragon	Wheel	Irreversible	Worm-and-Segment	Behind Axle	Ball-and-Socket	Ball	Inverted Elliott	Pin	
Lambert	Wheel	Irreversible	Nut-and-Screw	Before Axle	Ball-and-Socket	Plain	Elliott	Ball-and-Socket	Ball-and-Socket
Premier	Wheel	Irreversible	Nut-and-Screw	Behind Axle	Plain	Ball-Thrust	Lemoine Type	Ball-and-Socket	Ball-and-Socket
Premier	Wheel	Irreversible	Nut-and-Screw	Behind Axle	Plain	Ball-Thrust	Lemoine Type	Ball-and-Socket	Ball-and-Socket
Grout	Wheel	Irreversible	Worm-and-Segment	Before Axle	Pin	Ball-Thrust	Lemoine Type	Ball-and-Socket	Ball-and-Socket
Dorris	Wheel	Irreversible	Rack-and-Pinion	Behind Axle	Ball-and-Socket	Plain	Inverted Elliott	Pin	Ball-and-Socket
Smith	Wheel	Irreversible	W'm-and-Int. Secto	Behind Axle	Ball-and-Socket	Plain	Inverted Elliott	Ball-and-Socket	Ball-and-Socket
Lambert	Wheel	Irreversible	Nut-and-Screw	Before Axle	Ball-and-Socket	Plain	Elliott	Ball-and-Socket	Ball-and-Socket
Logan	Wheel	Irreversible	Nut-and-Screw	Before Axle	Pin	Plain	Inverted Elliott	Ball-and-Socket	Pin
Marmon	Wheel	Irreversible	Worm-and-Segment	Before Axle	Pin	Plain	Inverted Elliott	Ball-and-Socket	Ball-and-Socket
St. Louis	Wheel	Reversible	Rack-and-Pinion	Behind Axle	Ball-and-Socket	Plain	Elliott	Pin	Pin
Wayne	Wheel	Irreversible	Nut-and-Screw	Behind Axle	Ball-and-Socket	Plain	Elliott	Ball-and-Socket	Ball-and-Socket
Wayne									
Atlas	Wheel	Irreversible	Worm-and-Segment						
Pennsylvania	Wheel	Irreversible	Nut-and-Screw	Before Axle	Ball-and-Socket	Ball-Thrust	Elliott	Pin	Ball-and-Socket
Ford	Wheel	Irreversible	Reduction Gears	Before Axle	Ball-and-Socket	Plain	Elliott	Pin	Pin
St. Louis	Wheel	Reversible	Rack-and-Pinion	Before Axle	Ball-and-Socket			Pin	Pin
Atlas	Wheel	Irreversible	Nut-and-Screw	Before Axle				Combination	
American	Wheel	Irreversible	Nut-and-Screw	Before Axle	Clevis-and-Pin	Ball-Thrust	Elliott	Ball-and-Socket	Ball-and-Socket
American	Wheel	Irreversible	Nut-and-Screw	Behind Axle	Clevis-and-Pin	Ball-Thrust	Elliott	Ball-and-Socket	Ball-and-Socket
Berkshire	Wheel	Irreversible	Worm-and-Segment	Behind Axle	Ball-and-Socket	Plain	Mercedes	Ball-and-Socket	Ball-and-Socket
Commerce	Wheel	Irreversible	Nut-and-Screw	Before Axle	Pin and Yoke	Plain	Inverted Elliott	Pin-and-Yoke	Cross-Shackle
Marmon	Wheel	Irreversible	Nut-and-Screw	Before Axle	Pin	Ball-Thrust	Inverted Elliott	Ball-and-Socket	Ball-and-Socket
Wayne	Wheel								
Acme	Wheel	Irreversible	Nut-and-Screw	Before Axle	Pin	Plain	Elliott	Ball-and-Socket	Ball-and-Socket
Acme	Wheel	Irreversible	Nut-and-Screw	Before Axle	Pin	Plain	Elliott	Ball-and-Socket	Ball-and-Socket
Craig-Toledo	Wheel	Irreversible	Nut-and-Screw						
Welch	Wheel	Irreversible	Worm-and-Segment	Behind Axle	Pin	Plain	Elliott	Ball-and-Socket	Ball-and-Socket
Am. Mors	Wheel	Irreversible	Worm-and-Segment	Before Axle	Plain		Elliott	Ball-and-Socket	Ball-and-Socket
Harrison	Wheel	Irreversible	Nut-and-Screw	Before Axle	Ball-and-Socket	Ball-Thrust	Elliott		
Am. Mors	Wheel	Irreversible	Worm-and-Sector	Before Axle	Ball-and-Socket	Ball-Thrust		Ball-and-Socket	Ball Thrust
Welch	Wheel	Irreversible	Worm-and-Segment	Behind Axle	Pin	Plain	Elliott	Ball-and-Socket	Ball-and-Socket
Am. Napier	Wheel	Irreversible	Worm-and-Segment	Before Axle	Ball-and-Socket	Ball-Thrust	Inverted Elliott	Ball-and-Socket	Ball-and-Socket
Westinghouse	Wheel	Irreversible	Nut-and-Screw	Behind Axle	Ball-and-Socket	Ball		Ball-and-Socket	Ball-and-Socket
Panhard	Wheel	Irreversible	Worm-and-Screw	Before Axle	Ball-and-Socket	Ball-Thrust	Lemoine	Ball-and-Socket	Pin
Panhard	Wheel	Irreversible	Worm-and-Screw	Before Axle	Ball-and-Socket	Ball-Thrust	Lemoine	Ball-and-Socket	Pin
Panhard	Wheel	Irreversible	Worm-and-Screw	Before Axle	Ball-and-Socket	Ball-Thrust	Lemoine	Ball-and-Socket	Pin
Mitchell	Wheel	Irreversible							
Mitchell	Wheel	Irreversible		Before Axle					
Pullman	Wheel	Irreversible		Before Axle					
Frayer-Miller	Wheel	Irreversible	Worm-and-Segment						
Compound									
Compound									
Compound									
Compound									
Mitchell	Wheel	Irreversible		Before Axle					
Pullman	Wheel	Irreversible							
Pullman	Wheel	Irreversible							
Triumph	Wheel	Irreversible							
National	Wheel	Irreversible	Nut-and-Screw	Both	Ball-and-Socket				
National	Wheel	Irreversible	Nut-and-Screw	Both	Ball-and-Socket	Ball-Thrust		Ball-and-Socket	
National	Wheel	Irreversible	Worm-and-Segment	Both	Ball-and-Socket			Ball-and-Socket	
Detroit	Wheel	Irreversible							
Aerocar	Wheel	Irreversible		Behind Axle		Ball-Thrust		Ball-and-Socket	Ball-and-Socket
Craig-Toledo	Wheel	Irreversible	Nut-and-Screw						
Rainier	Wheel	Irreversible	Nut-R'k-and-Pinion				Inv. Elliott		
Cleveland	Wheel	Irreversible					Inv. Elliott		
Compound									
Compound									
Am. Mercedes	Wheel	Irreversible	Worm-and-Segment	Behind		Ball-Thrust	Inv. Elliott		
B. L. M.	Wheel	Irreversible	Worm-and-Segment	Behind Axle		Spherical	Inv. Elliott		
Moore	Wheel	Irreversible	Worm-and-Segment						
Lane	Wheel	Irreversible	Worm-and-Segment	Behind Axle					
Lane	Wheel	Irreversible	Worm-and-Segment	Behind Axle					
Glide	Wheel	Irreversible	Worm-and-Segment			Roller			
Glide									
Glide	Wheel	Irreversible	Worm-and-Segment						
White									
Reo	Wheel	Irreversible	Worm-and-Segment	Behind Axle					
Reo	Wheel	Irreversible	Worm-and-Segment	Behind Axle					
Zust	Wheel	Irreversible	Worm-and-Segment	Behind Axle	Pin	Ball Thrust	Lemoine Type	Ball-and-Socket	Ball-and-Socket
Stoddard-Dayton	Wheel	Irreversible	Worm-and-Segment	Before	Ball-and-Socket	Plain	Elliott	Steel Bush	Pin
Stoddard-Dayton	Wheel	Irreversible	Nut-and-Screw	Before	Ball-and-Socket	Steel Bush	Elliott	Ball-and-Socket	Pin
Lansden	Wheel	Irreversible	Worm-and-Segment	Before Axle	Ball-and-Socket			Ball-and-Socket	
Johnson	Wheel	Irreversible	Worm-and-Segment	Before Axle	Ball-and-Socket	Plain		Ball-and-Socket	Ball-and-Socket
Martine	Wheel	Irreversible	Worm-and-Segment	Behind Axle	Ball-and-Socket			Ball-and-Socket	
Am. Truck	Wheel	Irreversible	Worm-and-Segment	Before Axle	Ball-and-Socket			Pin	
Moon	Wheel	Irreversible		Behind Axle	Ball-and-Socket			Ball-and-Socket	Ball-and-Socket
C. G. & V	Wheel	Irreversible	Worm-and-Segment	Behind Axle	Ball-and-Socket	Ball Thrust		Ball-and-Socket	Ball-and-Socket
Mercedes	Wheel	Irreversible	Worm-and-Segment	Behind Axle	Ball-and-Socket	Dbl. Bronze	Mercedes	Ball-and-Socket	Ball-and-Socket
English Daimler	Wheel	Irreversible	Worm-and-Segment	Behind Axle	Ball-and-Socket	Ball Thrust	Eng. Daimler	Ball-and-Socket	
English Daimler	Wheel	Irreversible	Worm-and-Segment	Behind Axle	Ball-and-Socket	Ball Thrust	Eng. Daimler	Ball and Socket	
English Daimler	Wheel	Irreversible	Worm-and-Segment	Behind Axle	Ball-and-Socket	Ball Thrust	Delahaye	Ball-and-Socket	Ball-and-Socket
Delahaye	Wheel	Irreversible		Behind Axle	Ball-and-Socket	Ball Thrust		Ball-and-Socket	Ball-and-Socket
Marion	Wheel	Irreversible	Nut-and-Screw	Behind Axle	Ball-and-Socket				
Austin	Wheel	Irreversible	Worm-and-Segment	Before Axle					
Carter-Car	Wheel	Irreversible	Worm-and-Segment	Before Axle					
Moline	Wheel	Irreversible	Worm-and-Segment	Before Axle	Bin			Ball-and-Socket	Ball-and-Socket
Wood	Wheel	Irreversible		Before Axle					
Pungs-Finch	Wheel								
Pierce-Racine	Wheel	Irreversible	Screw Nut	Before Axle					
Rambler	Wheel	Irreversible	Nut-and-Screw						Ball-and-Socket
Crawford	Wheel	Irreversible		Behind Axle	Ball-and-Socket	Plain		Ball-and-Socket	
Berliet	Wheel	Irreversible	Worm-and-Segment						Ball-and-Socket
Frontenac	Wheel		Special	Behind Axle	Ball-and-Socket	Ball-Thrust		Ball-and-Socket	
Rambler	Wheel	Irreversible	Worm-and-Segment						Ball-and-Socket
Deere	Wheel	Irreversible	Worm-and-Segment		Ball-and-Socket	Plain		Ball-and-Socket	
Itala	Wheel	Irreversible	Worm-and-Segment	Before Axle					Ball-and-Socket
Simplicity		Irreversible		Behind Axle	Ball-and-Socket	Plain		Ball-and-Socket	

BRAKES

Name	Wheel Brakes	Transmission Brakes	Operation	Compensation	Material of Friction Surfaces	Cooling	Miscellaneous
Ford	Internal, Expanding	One, Constricting	Push Pedal for Both	Adjustable	Bronze, Steel, Fiber	None	Ford
Holsman	Rim	Two	Lever Forwards for Rim	Adjustable	Fiber to Steel	None	Radius Rods.
Maxwell	External, Constricting	None	Push Pedal for Transmission	None	Fiber to Castiron	None	
Logan		Two	Push Pedal	None	Belting	None	
Torbensen	External Band	External Band	Pedal and Side Lever		"Camel's Hair" Band	None	
Maxwell	Internal and External	None	Push Pedal for Transmission	None	Hickory and Steel	None	
Logan	Internal and External	None	Pedal and Side Lever	None	Leather to Castiron	None	Torsion Tube.
Dragon	Internal and External	None	Push Pedal and Lever	Adjustable	"Camel's Hair"	None	
Lambert	Internal, Expanding	One, Expanding	Push Pedal and Lever	Adjustable	Leather to Metal	None	Radius Rods.
Premier	Internal, Expanding	One	Push Pedal and Lever	None	Bronze to Steel	None	Double Rod.
Premier	Internal, Expanding	One	Push Pedal and Lever	None	Bronze to Steel	None	Double Rod.
Grout	Internal and External	None	Push Pedal and Lever	Adjustable	Belt and Fiber	None	Combination.
Dorris	Internal, Expanding	Constricting	Push Pedal for Transmission	Adjustable	"Camel's Hair" & Iron	None	Torsion Rod.
Smith	Cone Clutch	Bronze Band	Push Pedals	Yes	Leather, Iron, Bronze	Oil	
Lambert	Internal, Expanding	One, Countershaft	Pedal and Lever	Adjustable	Leather to Metal	None	Radius Rods.
Logan	External, Constricting	Two, Constricting	Push Pedal and Lever	By Levers	Belting and Iron	None	Radius Rods.
Marmon	Internal, Expanding	One, Constricting	Push Pedals	Adjustable	Bronze to Castiron	None	Equalized.
St. Louis	Internal, Expanding	One, Constricting	Push Pedals and Lever	Adjustable	Bronze to Steel	None	Torsion Rod.
Wayne	Internal and External		Pedal and Lever	Levers	Fiber and Steel	None	Torsion Rod.
Wayne	Internal, Expanding		Pedal		Bronze to Steel	None	Torsion Rod.
Atlas	Internal, Expanding	One	Pedal	By Levers	Leather to Iron	None	
Pennsylvania	Internal and External		Push Pedal and Lever		"Camel's Hair"	None	Combination.
Ford	Internal, Expanding	One, Constricting	Push Pedal and Lever	Adjustable	"Camel's Hair"	None	Ford.
St. Louis	Internal and External		Lever Forwards for Hub	By Levers	Cloth to Steel	Air	Combination.
Atlas	Internal and External		Pedal	None	Leather to Bronze	Water	
American	Internal, Expanding	Constricting	Push Pedal and Lever	Adjustable	Bronze to Steel	None	Torsion Rod.
American	Internal, Expanding	Constricting	Push Pedal and Lever	Adjustable	Bronze to Steel	None	Torsion Rod.
Berkshire	Internal, Expanding	One, Constricting	Push Pedal and Lever	Adjustable	Bronze to Steel	None	Radius Rods.
Commerce	Internal, Expanding	Two, Countershaft	Push Pedal and Lever	Adjustable	"Camel's Hair"	None	Radius Rods.
Marmon	Four Expanding	None	Push Pedal and Lever	Adjustable	Bronze to Castiron	None	Equalized.
Wayne	Internal, Expanding		Pedal and Lever	None	Bronze to Steel	None	Torsion Rod.
Acme	External, Constricting	Two, Constricting	Push Pedal and Lever	By Levers	Hemp, Iron, Brass	None	Radius Rod.
Acme	Internal and External		Push Pedal and Lever	By Levers	Bronze, Hemp, Steel	None	Radius Rod.
Craig Toledo	External, Constricting					None	
Welch	Internal and External		Push Pedals		"Camel's Hair" to Steel	None	
Am. Mors	Internal, Expanding	One, Constricting	Push Pedals and Lever	Adjustable	Castiron to Steel	None	Radius Rods.
Harrison	Internal and External	None	Pedals	By Levers	Malleable to Steel	None	Torsion Rod.
Am. Mors	Internal and External	One, Constricting	Push Pedal and Lever	Adjustable	Castiron to Steel	None	Radius Rods.
Welch	Internal and External		Push Pedals		"Camel's Hair" on Steel	None	
Am. Napier	Internal, Expanding	One Band Brake	Push Pedal for Transmission	Adjustable	Castiron to Steel	None	Radius Rods.
Westinghouse	Internal, Expanding	Two, Constricting	Push Pedals and Lever	By Cable	Castiron to Steel	None	
Panhard	Internal, Expanding	One	Push Pedal	By Cable	Castiron to Castiron	None	
Panhard	Internal, Expanding	One	Push Pedal	By Cable	Castiron to Castiron	None	
Panhard	Internal, Expanding	One	Push Pedal	By Cable	Castiron to Castiron	None	
Mitchell	Internal and External		Push Pedal and Lever				
Mitchell	Internal, Expanding	1 Constricting	Push Pedal for Transmission				
Pullman	Internal, Expanding	2 Constricting	Push Pedal for Transmission				
Frayer-Miller							
Compound							
Compound							
Compound							
Compound							
Mitchell	Internal and External		Push Pedal for External				Torsion Rod.
Pullman	Internal, Expanding		Levers Backward for Hub				Torsion Rod.
Pullman	Internal, Expanding		Levers Backward for Hub				Torsion Rod.
Triumph	Internal and External		Push Pedal for External				Torsion Rod.
National	4 Internal, Expanding		Pedal and Lever		Metal to Metal		Torsion Rod.
National	4 Internal, Expanding		Push Pedal and Lever				Torsion Rod.
National	4 Internal, Expanding		Push Pedal and Lever		Metal to Metal	None	Torsion Rod.
Detroit	Internal and External		Push Pedal and Lever				
Aerocar	Internal, Expanding	1 Constricting	Push Pedal and Lever		Camel's Hair to Steel	None	Torsion Rod.
Craig-Toledo	Internal and External		Push Pedal and Lever				
Rainier	Internal, Expanding	1 Constricting	Push Pedal and Lever		Bronze to Steel		Torsion Rod.
Cleveland	Internal, Expanding	1 Constricting	Push Pedal and Lever			None	Torsion Rod.
Compound							
Compound							
Am. Mercedes	Internal, Expanding	2 Constricting	Push Pedal and Lever	By Wire	Castiron to Steel	Water	Radius Rods.
B. L. M.	Internal, Expanding	1 Constricting	Push Pedal and Lever		Bronze to Steel	None	Radius Rods.
Moore	Internal, Expanding	1 Constricting	Push Pedal, Trans., and Hub			Water	
Lane	External, Constricting	1 Constricting	Push Pedal and Lever			None	Radius Rods.
Lane	External, Constricting	1 Constricting	Push Pedal and Lever				Radius Rods.
Glide	Multiple Disk		Push Pedal and Lever				
Glide							
Glide	Multiple Disk						
White							
Reo	Internal, Expanding	1 Constricting	Push Pedal and Lever	Adjustable	Fiber to Castiron	None	Radius Rods.
Reo	Internal, Expanding		Push Pedal for Transmission	None			Radius Rods.
Zust	Internal, Expanding	2 Constricting	Pedal and Lever	By Lever	Bronze to Steel	None	Radius Rods.
Stoddard-Dayton	Internal, Expanding	1 Expanding	Pedal and Lever	Adjustable	Camel's Hair to Steel	None	Radius Rods.
Stoddard-Dayton	Internal, Expanding	1 Expanding	Pedal and Lever	Adjustable	Camel's Hair to Steel	None	Radius Rods.
Lansden	Internal, Expanding	1 Constricting	Push Pedal	None	Wood to Steel	None	Radius Rods.
Johnson	Internal and External		Push Pedal		Steel to Steel		
Martine	Internal, Expanding	2 Constricting	Pedal and Lever	By Reverse	Castiron to Steel	Water	
Am. Truck	Internal, Expanding	2 Constricting	Pedal and Lever	Adjustable	Castiron	None	Radius Rods.
Moon	Internal and External	None	Pedal and Lever	By Levers	Leather to Castiron	None	Torsion Rods.
C. G. & V.	Internal, Expanding	1 Constricting	Pedal and Lever		Fiber to Castiron		
Mercedes	Internal, Expanding	Constricting	Pedal and Lever	Wire	Castiron to Steel	Water	Radius Rods.
English Daimler	External, Constricting	2 Constricting	Pedal and Lever	Adjustable	Castiron to Steel	None	Radius Rods.
English Daimler	External, Constricting	2 Constricting	Pedal and Lever	Adjustable	Castiron to Steel	None	Radius Rods.
English Daimler	External, Constricting	2 Constricting	Pedal and Lever	Adjustable	Castiron to Steel	None	Radius Rods.
Delahaye	Internal, Expanding	1 Constricting	Pedal and Lever	By Levers		None	None.
Marion	Internal and External	Hassler	Pedal and Lever	Adjustable	Leather		Torsion Rods
Austin	Expanding	One	Lever Forwards for Hub	Screws	Leather		Torsion Rods.
Carter-Car				Adjustable			
Moline	Constricting		Push Pedal		Leather		
Wood	Internal, Expanding		Push Pedal		Bronze Steel		
Pungs-Finch	Internal, Expanding	1 Constricting	Lever				
Pierce-Racine	Internal and External		Pedal and Lever				
Rambler	External, Constricting	1 Constricting	Pedal and Lever		Leather		Radius Rods.
Crawford	Two		Lever	Adjustable			
Berliet	Internal, Expanding		Push Pedal	Adjustable	Bronze Steel	None	Radius Rods.
Frontenac	Internal, Expanding	1 Constricting					
Rambler	Internal, Expanding	1 Constricting	Pedal and Lever	Adjustable		None	
Deere	External, Constricting		Push Pedal	Adjustable			
Itala	Internal, Expanding		Push Pedal	Wire		Water	Torsion Rods.
Simplicity	External, Constricting		Levers				

THE ENGINE

Name	Cylinders: Support	Cylinders: Number	Cylinders: Arrangement	Cylinders: How Cast	Cylinders: Heads	Cylinders: Waterjackets	Cylinders: Bore	Cylinders: Stroke	Pistons: Length	Pistons: Piston-Pin Position	Piston Rings: Number	Piston Rings: Placing
Ford	Three-Point	Four	Vertical, L'wise	In Pairs	Integral	Integral	3 3/4	3 3/8			Three	3 at Top
Holsman	Main Frame	Two	Horizontal	One Casting	Screw In		4	4				
Maxwell	Three-Point	Two	Crosswise in Front	Separately	Integral		4 1/2	4			Three	3 at Top
Logan	Sub-Frame	Two	Crosswise in Front	Separately	Integral		4 1/16	4		Below Center	Four	4 at Top
Torbensen	Sub-Frame	Two	Crosswise in Front	Opposed	Integral	None	5 1/8	4 1/2	5½	½ in. Below Center	Three	3 at Top
Maxwell	Three-Point	Four	Horizontal	Separately	Integral		5	5	4½	Centered	Three	3 at Top
Logan	Sub-Frame	Four	Vertical in Front	Separately	Integral		4	4		Below Center	Four	3 at Top, 1 at Bottom
Dragon	Sub-Frame	Four	Vertical in Front	In Pairs	Integral	Integral	4	4 1/2		Near Top	Three	3 at Top
Lambert	Main Frame	Four	Vertical in Front	Separately	Integral	Integral	4 1/2	5	5	Above Center	Four	3 at Top, 1 at Bottom
Premier	On Frame	Four	Vertical in Front	Separately	Integral	Integral	4 1/4	4 1/4	4½	½ in. Above Center	Four	3 at Top, 1 at Bottom
Premier	On Frame	Four	Vertical in Front	Separately	Integral	Integral	4 1/4	4 1/4	4½	½ in. Above Center	Four	3 at Top, 1 at Bottom
Grout	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	4 1/2	5	4½	½ in. Above Center	Four	4 at Top
Dorris	Three-Point	Four	Vertical in Front	In Pairs	Integral	Integral	4 1/4	5	5	Centered	Four	4 at Top
Smith	Three-Point	Four	Vertical in Front	Separately	Integral	Intergal	4 1/2	5	5½	2 in. From Top	Three	3 at Top
Lambert	Three-Point	Four	Vertical in Front	Separately	Integral	Integral	4 1/2	5		Above Center	Four	3 at Top, 1 at Bottom
Logan	Main Frame	Two	Crosswise in Front	Sepa ately	Integral	Integral	5 1/2	6		Below Center	Four	4 at Top
Marmon	Three-Point	Four	V-Shaped in Front	Separately	Integral	None	4 1/4	4			Four	3 at Top, 1 at Bottom
St. Louis	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	4 1/4	5	4½	Below Center	Four	4 at Top
Wayne	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	4 1/2	5 1/4	5	Above Center	Four	4 at Top
Wayne	Three-Point	Four	Vertical in Front	In Pairs	Integral	Integral	4 3/4	5	5	Above Center	Four	3 at Top, 1 at Bottom
Atlas	Three-Point	Two	Vertical in Front	Separately	Integral	Integral	6	5	5	Above Center	Three	3 at Top
Pennsylvania	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	4 1/2	5	4½	Above Center	Four	4 at Top
Ford	Main Frame	Six	Vertical in Front	Sepa ately	Integral	Integral	4 1/2	4 1/4		Above Center	Six	3 at Top
St. Louis	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	4 1/2	5 1/2	6	Below Center	Four	3 at Top, 1 at Bottom
Atlas	Sub-Frame	Two	Horizontal	Separately		None	6	7 1/2		½ in. Above Center	Three	3 at Top
American	Sub-Frame	Four	Vertical in Front	In Pairs	Integral	Integral	5	5		Above Center	Four	4 at Top
American	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	5	5		Above Center	Four	4 at Top
Berkshire	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	4 11/16	5 1/2	6	Centered	Three	3 at Top
Commerce	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	4 3/4	4 1/4	6½	¼ in. Above Center	Four	3 at Top, 1 at Bottom
Marmon	Three-Point	Four	V-Shaped in Front	Separately	Integral	None	5	4 1/2			Six	4 at Top, 2 at Bottom
Wayne	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	5 1/2	5			Four	3 at Top, 1 at Bottom
Acme											Four	3 at Top, 1 at Bottom
Acme	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	4 3/4	5		Above Center	Four	3 at Top, 1 at Bottom
Craig-Toledo	Three-Point	Four	Vertical in Front	In Pairs	Integral	Integral	4 3/4	5				
Welch	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	4 5/8	5		Above Center	Four	4 at Top
Am. Mors	Main Frame	Four	Vertical in Front	Separately	Integral	In Pairs	4 1/4	5 9/10		Above Center	Three	3 at Top
Harrison	Saddles Two	Four	Vertical in Front	Separately	Attached	Integral	4 3/4	5	6	Below Center	Four	3 at Top
Am. Mors	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	4 9/10	5 9/10	6	Above Center	Three	3 at Top
Welch	Main Frame	Six	Vertical in Front	In Pairs	Integral	Integral	4 5/8	5		Above Center	Four	4 at Top
Am. Napier	Main Frame	Six	Vertical in Front	In Pairs	Integral	Integral	5	4	5½	Centered	Three	3 at Top
Westinghouse	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	4 3/4	5 1/2			Four	4 at Top
Panhard	Sub-Frame	Six	Vertical in Front	Separately	Integral	Integral					Six	4 at Top
Panhard	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	4 3/4	5 1/2	8	Above Center	Four	4 at Top
Panhard	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	4 3/4	5 1/2	8	Above Center	Four	4 at Top
Mitchell	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	4 1/2	5		Above Center	Two	4 at Top
Mitchell		Four	Vertical in Front	Separately	Integral	Integral	4 1/4	5		Center	Four	4 at Top
Pullman		Three	Vertical in Front	Separately	Integral	Integral						
Prayer-Miller		Four	Vertical in Front	Separately	Integral	Air J'k'ts						
Compound		Three	V'l in Fr't Comp				4	4				
Compound		Three	V'l in Fr't Comp				4 1/2	4				
Compound		Three					4 1/2	4				
Compound		Three	V'l in Fr't Comp				4	4				
Mitchell	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	3 3/4	4		At Center	Two	4 at Top
Pullman		Four	Vertical in Front		Integral	Integral						
Pullman		Four	Vertical in Front		Integral	Integral						
Triumph	Sub-Frame	Four	Vertical in Front	In Pairs	Integral	Integral						
National	Sub-Frame	Six	Vertical in Front	Separately	Integral	Integral	4 7/8	5				
National	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	4 7/8	5				
National	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	4 1/2	5				
Detroit		Two	Crosswise in Front	Separately	Integral	Integral	5 1/8	4 1/2				
Aerocar	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	5	5			Five	
Craig-Toledo	Three-Point	Four	Vertical in Front	In Pairs	Integral	Integral	4 3/8	5				
Rainier	Sub-Frame	Four	Vertical in Front	In Pairs	Integral	Integral					Four	
Cleveland	Sub-Frame	Four	Vertical in Front	In Pairs	Integral	Integral					Four	
Compound		Three	V'l in Fr't Comp	In Pairs	Integral	Integral	4 1/2	4				
Compound		Six	V'l in Fr't Comp	4 High, 2 Low								
Am. Mercedes	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	120mm	150mm		Near Center	Four	4 at Top
B. L. M	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	100mm	125mm				
Moore	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	4 1/2	5 1/2		Near Center	Four	
Lane		Two	Vertical in Front	1 Casting	Attached		Comp'd			Disk		
Lane		Two	Vertical in Front	1 Casting	Attached		Comp'd	3 1/2		Disk		
Glide	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	4 1/2	5				
Glide		Six					4 1/2	5				
Glide	Sub-Frame	Four	Vertical in Front		Integral	Integral	4 1/2	5				
White		Two	V'l in Fr't Comp	1 Casting	Attached		3 & 6	4 1/2				
Reo		Two	Horizontal, Longi	Separately	Integral	Integral	4 3/4	6				
Reo	Main Frame	One	Horizontal, Longi	Separately	Integral	Integral	4 3/4	6				
Zust	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	5 1/4		5½	Center	Three	
Stod'd-D'ton	Sub-Frame	Four	Vertical in Front	In Pairs	Integral	Attached	3 1/8		3½		Three	3 at Top
Stod'd-D'ton	Sub-Frame	Four	Vertical in Front	In Pairs	Integral	Integral	4 5/8		5			3 at Top
Lansden												
Johnson	Main Frame	Four	Vertical in Front	1 Casting	Attached		Steam					
Martine	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral					Four	
Am. Truck	Main Frame	Four	Vertical in Front	Separately	Integral	Integral	5		6	Center	Three	
Moon	Sub-Frame	Four	Vertical in Front	In Pairs	Integral	Integral	4 1/2		4½			
C. G. & V	Sub-Frame	Four	Vertical in Front	Separately	Integral	Integral	95mm	120mm			Four	
Mercedes	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	145mm	165mm		Above Center	Four	3 at Top
Eng. Daimler		Four	Vertical in Front	In Pairs	Integral	Integral	150mm	150mm		Center	Four	Top
Eng. Daimler		Four	Vertical in Front	In Pairs	Integral	Integral	140mm	150mm		Center	Four	Top
Eng. Daimler		Four	Vertical in Front	In Pairs	Integral	Integral	130mm	150mm		Center		Top
Delahaye			Vertical in Front	Separately	Attached	Integral				One		
Marion	Main Frame	Four	Vertical in Front	Separately	Integral	Integral	4		4	Above Center	Four	
Austin		Four	Vertical in Front	Separately	Integral	Integral	5 1/2				Three	
Carter-Car			Crosswise in Front		Integral	Integral						
Moline	Main Frame	Four	Vertical in Front	In Pairs	Integral	Integral	4 1/2		5			
Wood		Four	Vertical in Front	Separately	Integral	Integral						
Pungs-Finch		Four	Vertical in Front	In Pairs	Integral	Integral	4		4½			
Pierce-Racine		Four	Vertical in Front	In Pairs	Integral	Integral						
Rambler			Horizontal, Longi	Separately	Integral		4 1/2	5				
Crawford		Four	Vertical				4 1/2	5				
Berliet	Sub-Frame	Four	Vertical	Separately	Integral		4 3/4	5 1/2				
Frontenac		Four	Vertical		Integral							
Rambler	Three-Point	Four	Vertical	Separately	Integral		5	5 1/2			Six	Top and Bottom
Deere		Four	Vertical	Separately	Integral		4	5				
Itala	Sub-Frame	Four	Vertical	In Pairs	Integral		130mm	140mm				
Simplicity		Four	Vertical	In Pairs	Integral		4 1/2	5 3/4				

THE ENGINE—*Continued*

Name	CONNECTING RODS: Weight, in Ozs.	CONNECTING RODS: Length, in Inches	CONNECTING RODS: Cross Section	CONNECTING RODS: Material	CONNECTING RODS: Piston Bearing	CONNECTING RODS: Big-End Bearing	VALVES: Diameter Inlet	VALVES: Lift Inlet	VALVES: Diameter Ext.	VALVES: Lift Exhaust	VALVES: Placing	VALVES: Interchangeable	VALVE OPERATION: Remarks	VALVE OPERATION: Springs
Ford	...	...	H-Section.	Carbon Steel.	Bronze.	Babbitt	1 1/2	1/8	1 1/2	1/4	Inlet Beside Exhaust.	Yes.	Push Rods	Helical.
Holsman	...	...	...	...	...	...	...	...	...	...	Inlet Above Exhaust.	No.	Inlets, Automatic	...
Maxwell	...	...	Channel	...	Bronze.	Babbitt	...	...	...	...	Both in Head	Yes.	Push Rods	Helical.
Logan	...	...	...	Carbon Steel.	Bronze.	Parsons	1 7/8	1/4	1 7/8	1/4	Inlet above Exhaust.	Yes.	Push Rods, Rockers.	Helical.
Torbensen	...	9	I-Section.	Carbon Steel.	Bronze.	Babbitt	1 1/4	1	3/4	...	...	Yes.	Push Rods	Helical.
Maxwell	...	...	Channel	...	Bronze.	Babbitt	...	...	...	...	Inlet beside Exhaust.	No.	Push Rods	Helical.
Logan	...	...	I-Section.	Carbon Steel.	Bronze.	Parsons	1 1/2	7/16	1 1/2	1/2	Both in Head	Yes.	Push Rods, Rockers.	Helical.
Dragon	...	10 11/16	I-Section.	Drop Forging	Bronze.	Bronze	1 3/4	3/8	1 3/4	3/8	Opposite	Yes.	Push Rods	Helical.
Lambert	...	...	H-Section.	Steel Forging.	Bronze.	Bronze	1 5/8	5/16	1 5/8	3/8	Inlet beside Exhaust.	Yes.	Push Rods	Helical.
Premier	44	9	I-Section.	Carbon Steel.	Bronze.	Parsons	1 5/8	5/16	1 5/8	3/8	Opposite	Yes.	Push Rods	Helical.
Premier	44	9	I-Section.	Carbon Steel.	Bronze.	Parsons	2	3/8	2	3/8	Opposite	Yes.	Push Rods	Tapered
Grout	72	10 1/4	I-Section.	Carbon Steel.	Bronze.	Babbitt	1 1/2	5/16	1 1/2	5/16	Inlet beside Exhaust.	Yes.	Push Rods	Helical.
Dorris	...	10	I-Section.	...	Bronze.	Parsons	1 3/4	1/4	1 3/4	5/16	Both in Head	Yes.	2 from One Cam	Helical.
Smith	56	10 1/2	H-Section.	Carbon Steel.	Bronze.	Babbitt	1 3/4	3/8	1 3/4	3/8	Opposite	Yes.	Push Rods	Helical.
Lambert	...	...	H-Section.	Steel Forging.	Bronze.	Combination	...	...	...	...	Inlet beside Exhaust.	Yes.	Push Rods	Helical.
Logan	...	...	I-Section.	Carbon Steel.	Bronze.	Parsons	1 5/8	5/16	1 5/8	3/8	Opposite	No.	Push Rods	Helical.
Marmon	...	99	I-Section.	Carbon Steel.	Bronze.	Babbitt	1 1/2	3/8	1 1/2	3/8	Both in Head	Yes.	Rockers	Helical.
St. Louis	18	12	Round	...	Bronze.	Combination	...	...	...	...	Inlet beside Exhaust.	Yes.	Push Rods	Helical.
Wayne	...	12	I-Section.	Carbon Steel.	Bronze.	Bronze	...	...	...	...	Inlet beside Exhaust.	Yes.	Push Rods	Helical.
Wayne	...	...	I-Section.	Carbon Steel.	...	Babbitt	...	...	...	...	...	...	Push Rods	Helical.
Atlas	...	...	Rectangle.	Man. Bronze.	Bronze.	Bronze	1 3/4	1/4	1 3/4	1/4	...	...	...	...
Pennsylvania	...	...	I-Section.	Carbon Steel.	Bronze.	Bronze	2	...	2	...	Inlet beside Exhaust.	Yes.	Push Rods	Helical.
Ford	48	...	H-Section.	Ch. N'l Steel.	Bronze.	Babbitt	...	...	...	3/8	Inlet beside Exhaust.	Yes.	Push Rods	Helical.
St. Louis	...	...	H-Section.	...	Bronze.	Babbitt	1 3/4	3/16	2	7/16	Opposite	...	Push Rods	Helical.
Atlas	...	...	I-Section.	Carbon Steel.	Steel.	Combination	2	7/16	2	7/16	Both in Head	No.	Push Rods	Spiral.
American	...	12	I-Section.	Forged Steel.	Steel.	Babbitt	2	7/16	2	7/16	Inlet beside Exhaust.	Yes.	Push Rods	Helical.
American	...	12	I-Section.	Forged Steel.	Steel.	Babbitt	1 7/8	5/16	1 7/8	7/16	Inlet beside Exhaust.	Yes.	Push Rods	Helical.
Berkshire	102	12	H-Section.	Mang. Bronze	Steel.	Parsons	1 7/8	5/16	1 7/8	3/8	Opposite	Yes.	Push Rods	Helical.
Commerce	27	10 1/2	H-Section.	Carbon Steel.	Steel.	Parsons	2 1/4	5/16	2 1/4	3/8	Inlet beside Exhaust.	Yes.	...	Helical.
Marmon	...	...	I-Section.	Carbon Steel.	Bronze.	Babbitt	...	...	...	...	Both in Head	Yes.	Rockers	Helical.
Wayne	...	...	I-Section.	Carbon Steel.	...	...	...	...	...	...	...	Yes.	Push Rods	Helical.
Acme	...	11 1/2	I-Section.	Drop Forging	Steel.	Bronze	...	...	...	...	...	...	Push Rods	Helical.
Acme	...	11 1/2	I-Section.	Drop Forging	Steel.	Bronze	...	...	...	...	Opposite	Yes.	Push Rods	Helical.
Craig-Toledo	...	...	...	...	Bronze.	...	1 3/4	5/32	1 3/4	5/16	Inlet beside Exhaust.	...	All Mechanical	...
Welch	...	...	I-Section.	D'p F'g'd St'l	Bronze.	Combination	1 11/16	5/16	1 11/16	5/16	Both in Head	Yes.	2 from One Cam	Tapered
Am. Mors	91	13 1/2	I-Section.	Nickel Steel.	...	Combination	...	...	...	...	Opposite	Yes.	Push Rods	Helical.
Harrison	...	...	I-Section.	Carbon Steel.	Bronze.	Bronze	1 7/8	1/2	1 7/8	1/2	Both in Head	No.	Automatic Inlets	Helical.
Am. Mors	98	13	I-Section.	Ch. N'l Steel.	...	Combination	1 3/4	5/32	1 3/4	5/16	Opposite	Yes.	Push Rods	Helical.
Welch	...	...	I-Section.	D'p F'g'd St'l	Bronze.	Combination	2 1/2	7/16	2 1/2	7/16	Both in Head	Yes.	2 from One Cam	Tapered
Am. Napier	48	12	Tubular	Alloy Steel.	Bronze.	Babbitt	...	...	...	...	Inlet beside Exhaust.	Yes.	Push Rods	Helical.
Westinghouse	...	...	I-Section.	Ch. N'l Steel.	...	...	...	...	...	...	Opposite	Yes.	...	Helical.
Panhard	...	...	H-Section.	Ch. N'l Steel.	Babbit	...	...	...	...	...	Both in Head	Yes.	Push Rods	Helical.
Panhard	...	...	H-Section.	Ch. N'l Steel.	Babbit	...	...	...	...	...	Both in Head	Yes.	Push Rods	Helical.
Panhard	...	...	H-Section.	Ch. N'l Steel.	Babbit	...	...	...	...	...	Both in Head	Yes.	Push Rods	Helical.
Mitchell	...	...	H-Section.	...	...	...	...	...	...	...	Special	...	Push Rod & Rocker	Helical.
Mitchell	...	...	H-Section.	...	...	Plain	...	...	...	...	Special	No.	Rocker and Push	Helical.
Pullman	...	...	...	...	...	...	...	...	...	...	Inlet Beside Exhaust.	...	Push Rods	Helical.
Frayer-Miller	...	...	...	...	...	White Bronze	2 3/4	...	...	...	Opposite	...	Rockers	...
Compound	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Compound	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Compound	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Compound	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mitchell	...	...	H-Section.	...	...	Plain	...	...	...	...	Special	...	Push and Rocker	Helical.
Pullman	...	...	...	...	...	...	...	...	...	...	...	...	...	Helical.
Pullman	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Triumph	...	...	...	...	...	...	...	...	...	...	Inlet Beside Exhaust.	...	...	...
National	...	...	...	White Bronze	...	...	...	...	...	...	Opposite	Yes.	Push Rods	Helical.
National	...	...	...	...	...	White Bronze	...	...	...	...	Opposite	Yes.	Push Rods	Helical.
National	...	...	...	...	...	...	...	...	...	...	Opposite	Yes.	...	...
Detroit	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Aerocar	...	...	I-Section.	Carbon Steel.	Bronze.	Babbitted.	...	...	...	...	Inlet Beside Exhaust.	Yes.	...	...
Craig-Toledo	...	...	...	...	...	...	...	...	...	...	Inlet Beside Exhaust.	...	...	...
Rainier	...	...	...	Nickel Steel.	W. Br'ze	...	...	...	...	...	Opposite	Yes.	...	...
Cleveland	...	...	...	...	...	W. Bronze	...	...	...	...	Opposite	Yes.	...	...
Compound	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Compound	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Am. Mercedes	...	...	I-Section.	Nickel Steel.	S'l B'ing.	Babbitted	...	...	...	...	Opposite	Yes.	Push Rods	Helical.
B. L. M	...	...	...	...	...	Babbitted	...	...	...	...	Opposite	Yes.	Push Rods	Helical.
Moore	...	...	I-Section.	Ch. N'l Steel.	Cl. Type.	Bronze	...	...	...	...	Opposite	Yes.	Push Rods	Helical.
Lane	...	...	...	...	...	...	...	...	...	...	Slide	...	...	Helical.
Lane	...	...	...	...	...	...	...	...	...	...	Slide	...	Eccentric	None.
Glide	...	...	...	...	...	Babbitted	...	...	...	...	Inlet Beside Exhaust.	...	...	...
Glide	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Glide	...	...	...	...	...	...	...	...	...	...	Inlet Beside Exhaust.	...	...	...
White	...	...	...	...	...	...	...	...	...	...	Piston Valve	...	...	...
Reo	...	...	I-Section.	Carbon Steel.	Cl. Type.	Babbitted	...	...	...	...	Inlet Beside Exhaust.	...	Push Rods	Helical.
Reo	...	...	I-Section.	Carbon Steel.	Cl. Type.	Babbitted	...	...	...	...	Inlet Beside Exhaust.	...	Push Rods	Helical.
Zust	...	...	...	...	...	...	...	...	...	...	Inlet Beside Exhaust.	...	Push Rods	Helical.
Stod'd-Dayton	...	...	...	C. N. Steel.	S'l B,ing.	Babbitt	1 1/4	3/16	1 1/4	3/16	Opposite	Yes.	Push Rods	Helical.
Stod'd-Dayton	...	...	H-Section.	Carbon Steel.	S'l B'ing	Babbitt	1 3/4	5/16	1 3/4	5/16	Opposite	Yes.	Push Rods	Helical.
Lansden	...	...	H-Section.	Carbon Steel.	...	...	...	...	...	...	...	...	...	...
Johnson	...	...	...	...	...	...	...	...	...	...	Inlet Beside Exhaust.	...	Push Rods	Helical.
Martine	...	...	...	...	...	...	...	...	...	...	Opposite	Yes.	...	...
Am. Truck	...	...	...	...	Bronze.	...	...	...	...	...	Inlet Beside Exhaust.	...	Push Rods	Helical.
Moon	...	...	...	Drew Bronze.	...	...	...	...	...	...	Both in Head	...	Rockers	Helical.
C. G. & V.	...	...	...	...	...	...	...	...	...	...	Both in Head	...	...	...
Mercedes	...	...	...	...	S'l B'ing.	Babbitted	2 1/2	...	...	...	Opposite	Yes.	Push Rods	Helical.
Eng. Daimler	...	...	...	Mang. Bronze	Babbit'd	...	...	...	...	...	Inlet Beside Exhaust.	Yes.	Push Rods	Helical.
Eng. Daimler	...	...	I-Section.	C. N. Steel.	Babbit'd	...	...	...	...	...	Inlet Beside Exhaust.	Yes.	Push Rods	Helical.
Eng. Daimler	...	...	I-Section.	C. N. Steel.	Babbit'd	...	...	...	...	...	Inlet Beside Exhaust.	Yes.	Push Rods	Helical
Delahaye	...	...	I-Section.	C. N. Steel.	...	...	...	...	...	...	Opposite	Yes.	Push Rods	Helical.
Marion	...	...	...	Carbon Steel.	Alloy.	Alloy	...	...	...	...	Opposite	...	Push Rods	Helical.
Austin	...	...	...	...	...	...	...	...	...	...	Inlet Above Exhaust.	...	Rockers	Helical.
Carter-Car	...	...	...	...	...	...	...	...	...	...	Inlet Beside Exhaust.	...	Push Rods	Helical.
Moline	...	...	...	Ch. N'l Steel.	...	...	...	...	...	...	Opposite	...	Push Rods	...
Wood	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pungs-Finch	...	...	...	Steel Tubing.	Babbit'd	Babbitted	...	...	...	...	...	...	...	...
Pierce-Racine	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rambler	...	...	...	...	...	...	...	...	...	...	Inlet Beside Exhaust.	...	Push Rods	Helical.
Crawford	...	...	...	...	...	...	...	...	...	...	...	Yes.	...	...
Berliet	...	...	...	...	...	...	...	...	...	...	Opposite	...	...	...
Frontenac	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rambler	...	...	...	...	...	...	...	...	...	...	Both in Head	...	Push Rods	Helical.
Deere	...	...	...	...	...	...	...	...	...	...	Opposite	...	...	...
Itala	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Simplicity	...	...	...	...	...	...	...	...	...	...	Opposite	Yes.	Push Rods	Helical.

THE ENGINE—*Continued*

	CRANKSHAFT		MAIN BEARINGS		CAMSHAFTS			PIPING		MUFFLER	
Name	Material	How Manufactured	Type	Number	Placing	Drive	Cams	Intake Piping	Exhaust Piping	Cutout	Make
Ford	Nickel Steel	Drop Forged and Gr'd.	Babbitt	Three.	In Crankcase	Bronze Gears	Integral.	Bus Pipe	Bus Pipe	No.	Ford
Holsman											
Maxwell	Carbon Steel	Drop Forged and Fin'd	Babbitt	Two.	In Crankcase.	Bevel Gears	Pinned.	Single Y.	Double Y.	No.	Briscoe
Logan	Carbon Steel	Drop Forged and Fin'd	Bronze	Two.	On Crankcase	Steel Gears	Integral.	Single Y.	Single Y.	No.	Logan
Torbensen	Carbon Steel	Drop Forged	9 Bronze	Two.	Over Crank.	Steel Gears	Pinned.	Single Y.	Y Piping	Yes	
Maxwell	Carbon Steel	Drop Forged and Fin'd	Babbitt	Two.	In Crankcase.	Bevel Gears	Pinned.	Single Y.	Double Y.	No.	Briscoe
Logan	Carbon Steel	Drop Forged and Fin'd	Parsons	One.	On Crankcase	Steel and Bronze	Pinned.	D'ble Y.	Manifold	No.	Logan
Dragon	Carbon Steel	Hammer Forged	3 Parsons	Three.	In Crankcase.	Steel and Bronze.	Pinned.	Single Y.	Straight	Yes	Yankee
Lambert	Chrome-Nickel Steel	Drop Forged and Fin'd	Bronze	Five.	In Crankcase.	Bronze Gears		D'ble Y.	Bus Pipe	Yes	
Premier	Carbon Steel	Drop Forged and Gr'd.	Babbitt	Five.	In Crankcase.	Bronze Gears	Pinned.	D'ble Y.	Double Y.	Yes	Premier
Premier	Carbon Steel	Drop Forged and Gr'd.	Babbitt	Five.	In Crankcase.	Bronze Gears	Pinned.	D'ble Y.	Double Y.	Yes	Premier
Grout	Special Steel	Drop Forged and Fin'd	Babbitt	Five.	In Crankcase.	Steel Gears	Integral.	Bus Pipe	Bus Pipe	Yes	Grout
Dorris	Carbon Steel	Drop Forged and Fin'd	Parsons	Three.	In Crankcase.	Bevel Gears	Integral.	Single Y.	Bus Pipe	Yes	Dorris
Smith	Carbon Steel	Drop Forged and Fin'd	Parsons	Three.	In Crankcase.	Steel and Iron	Pinned.	Single Y.	Bus Pipe	Yes	Smith
Lambert	Chrome-Nickel Steel	Drop Forged and Fin'd	Bronze	Five.	In Crankcase.	Bronze Gears	Pinned.	D'ble Y.	Bus Pipe	Yes	
Logan	Carbon Steel	Drop Forged and Fin'd	Bronze	Two.	In Crankcase.	Steel and Bronze	Pinned.	Single Y.	Two Pipes.	No.	Logan
Marmon	Carbon Steel	Cut Out of Billet	Babbitt	Three.	In Crankcase.	Steel and Fiber	Pinned.	D'ble Y.	Individual.	Yes	Marmon
St. Louis	Carbon Steel	Drop Forged and Fin'd	Parsons	Three.	In Crankcase.	Bronze Gears	Pinned.	Bus Pipe	Bus Pipe		
Wayne	Steel	Drop Forged	Babbitt	Three.	In Case.	Bronze Gears	Pinned.	D'ble Y.		No.	
Wayne	Steel	Drop Forged	Babbitt	Three.	In Case.	Bronze Gears	Pinned.			No.	
Atlas	Forged Steel	Hand F'ged and Fin'd	Babbitt	Three.						No.	Kingston
Pennsylvania	Carbon Steel	Drop Forged	Combination	Five.	In Crankcase.	Spur Gear	Integral.	D'ble Y.	Double Y.	No.	
Ford	Chrome-Nickel Steel	Drop Forged	Babbitt	Seven.	In Crankcase.	Rawhide and Br'z	Integral.	Bus Pipe	Bus Pipe	No.	Ford
St. Louis	Carbon Steel	Cut Out of Billet	3 Bronze	Three.	In Crankcase.	Bronze Gears	Pinned.	Bus Pipe	Bus Pipe		
Atlas	Machine Steel	Hand Forged	Babbitt	Three.	In Crankcase.	Gear	Keyed.	Single Y.	Single Y.	No.	Yankee
American	Carbon Steel	Forged	Babbitt	Three.	In Crankcase.	Steel and Bronze	Pinned.	Single Y.	Bus Pipe	Yes	
American	Carbon Steel	Forged	Babbitt	Three.	In Crankcase.	Steel and Bronze	Pinned.	Single Y.	Bus Pipe	Yes	
Berkshire	Carbon Steel	Cut Out of Billet	5 Parsons	Five.	In Crankshaft	Steel and Bronze	Pinned.	D'ble Y.	Bus Pipe	Yes	Powell
Commerce	Chrome-Nickel Steel	Cut Out of Billet	Parsons	Three.	In Crankcase.	Bronze Gears	Pinned.	Single Y.	Manifold	No.	Special
Marmon	Carbon Steel	Cut Out of Billet	Babbitt	Three.	In Crankcase.	Steel and Fiber	Pinned.	D'ble Y.	Individual.	Yes	Marmon
Wayne	Steel	Drop Forged	Babbitt	Three.	In Case.	Bronze and Fiber	Pinned.	Single Y.	Single Y.	No.	
Acme	Chrome-Nickel Steel		Bronze	Five.	In Crankcase.	Gear	Pinned.	D'ble Y.	Double Y.	Yes	Acme
Acme	Chrome-Nickel Steel		Bronze	Five.	In Crankcase.	Gear	Pinned.	D'ble Y.	Double Y.	Yes	Acme
Craig-Toledo		Drop Forged and Fin'd	Offset	Three.	In Crankcase.	Gear	Integral.				
Welch	Chrome-Nickel Steel	Cut Out of Billet	Parsons	Five.	Superimp'sed	Bevel Gear	Integral.	Radial	Bus Pipe	Yes	Gray
Am. Mors	Chrome-Nickel Steel	Cut Out of Billet	Combination	Three.	In Crankcase.	Bronze and Fiber	Pinned.	D'ble Y.	Bus Pipe	No.	Mors
Harrison	Carbon Steel	Cut Out of Billet	5 Bronze		In Crankcase.	Bronze Gears	Pinned.	D'ble Y.	Bus Pipe	Yes	Harrison
Am. Mors	Chrome-Nickel Steel	Cut Out of Billet	Combination	Three.	In Crankcase.	Bronze and Fiber	Pinned.	Single Y.	Bus Pipe	No.	Mors
Welch	Chrome-Nickel Steel	Cut Out of Billet	Parsons	Five.	Superimp'sed	Bevel Gear	Integral.	Radial	Bus Pipe	Yes	Gray
Am. Napier	Alloy Steel	Hand Forged	Babbitt	Four.	In Crankcase.	Bronze Gears	Integral.	Special	Individual.	No.	West'gh'se
Westinghouse	Chrome-Nickel Steel	Cut Out of Billet	Anti-Friction	Three.	In Case.	Bronze Gears	Integral.	Y Piping	Bus Pipe	Yes	
Panhard	Chrome-Nickel Steel	Drop Forged			Crankcase	Fiber Gear	Integral.	Single Y.	Single Y.	No.	P. L.
Panhard	Chrome-Nickel Steel	Drop Forged			In Crankcase.	Fiber Gear	Integral.	Single Y.	Single Y.	No.	P. L.
Panhard	Chrome-Nickel Steel	Drop Forged			In Crankcase.	Fiber Gear	Integral.	Single Y.	Single Y.	No.	P. L.
Mitchell	Carbon Steel	Drop-Forged and Fin'd	Plain	Five.	In Crankcase.		Pinned.	Bus Pipe	Bus Pipe		
Mitchell	Carbon Steel	Drop-Forged and Fin'd	Plain	Five.	In Crankcase.		Pinned.	Bus Pipe	Bus Pipe		
Pullman								D'ble Y.	Double Y.		
Prayer-Miller		Cut Out of Billet	White Bronze				Integral.				
Compound											
Compound											
Compound											
Compound											
Mitchell	Carbon Steel	Drop-Forged and Fin'd	Plain	Five.	In Crankcase.		Pinned.	Bus Pipe	Bus Pipe		
Pullman											
Pullman											
Triumph											
National			Annular Ball		Annular Ball		Integral.				
National			Annular Ball		Annular Ball						
National											
Detroit											
Aerocar	Carbon Steel	Drop-Forged and Fin'd	Babbitt	Five.	In Crankcase		Integral.	D'ble Y.	Double Y.		
Craig-Toledo	Carbon Steel	Drop-Forged and Fin'd	White Bronze		In Crankcase.		Integral.				
Rainier	Carbon Steel	Cut Out of Billet	White Bronze		In Crankcase.	Bronze and Fiber	Pinned.				
Cleveland			White Bronze								
Compound											
Compound											
Am. Mercedes	Chrome-Nickel Steel	Cut Out of Billet	3 Hess-Bright		In Crankcase.	Rawhide Gears	Integral.	Single Y.	Bus Pipe		
B. L. M.	Chrome-Nickel Steel	Cut Out of Billet	Babbitt		In Crankcase.	Rawhide Gears	Integral.	Single Y.	Bus Pipe		
Moore	Chrome-Nickel Steel	Built up	Hess-Bright	Five.	In Crankcase.	Spiral Gears	Integral.	D'ble Y.			
Lane	Carbon Steel	Cut Out of Billet	Annular Ball		In Crankcase.						
Lane	Carbon Steel	Cut Out of Billet	Ball		None	None	None				
Glide	Nickel Steel	Cut Out of Billet	Babbitt				Integral.	D'ble Y.			Torpedo
Glide											
Glide											
White											
Reo	Carbon Steel	Drop-Forged and Fin'd	Babbitt	Two.	In Crankcase.	Bronze Gears	Pinned.				
Reo	Carbon Steel	Drop-Forged and Fin'd	Bronze	Two.	In Crankcase.	Bronze Gears	Pinned.				
Zust	C. N. Steel	Cut Out of Billet	Babbitted		In Crankcase.	Bronze Gear	Integral.	Single Y.	Single Y.	No.	
Stoddard D'ton	Carbon Steel	Drop-Forged	Babbitted		In Crankcase.	Gears	Pinned.	Single Y.	Bus Pipe	No.	D. M. C. Co.
Stoddard D'ton	Carbon Steel	Forged and Finished			In Crankcase.	Rawhide Gears	Pinned.	Single Y.	Bus Pipe	No.	D. M. C. Co.
Lansden											
Johnson			Bronze		Crankcase						
Martine			Babbitt					Single Y.	Bus Pipe		
Am. Truck	Machine Steel	Cut Out of Billet	Babbitt		In Crankcase.	Steel Gears	Pinned.	D'ble Y.	Bus Pipe	No.	
Moon					Overhead	Bevel Gears	Integral.	Single Y.	Bus Pipe		Gray
C. G. & V.			3 Hess-Bright								
Mercedes	C. N. Steel	Drop-Forged and Fin'd	Babbitt		In Crankcase.	Steel Gears	Integral.	Single Y.	Single Y.		Mercedes
English Daimler	C. N. Steel	Drop-Forged and Fin'd	Babbitt		In Crankcase.	Steel Gears	Integral.	Single Y.	Single Y.		
English Daimler	C. N. Steel	Drop-Forged and Fin'd	Babbitt		In Crankcase.	Steel Gears	Integral.	Single Y.	Single Y.		
English Daimler	C. N. Steel	Drop-Forged and Fin'd	3 Hess-Bright		In Crankcase.	Steel Gears	Integral.	Single Y.	Single Y.		
Delahaye	C. N.			3.	In Crankcase.	Steel Gears	Integral.	D'ble Y.	Bus Pipe		
Marion	Carbon Steel	Drop-Forged and Fin'd	5 Bronze	Three.	In Crankcase.	Steel	Pinned.	Bus Pipe	Bus Pipe	Yes	Kinsey
Austin		Drop-Forged and Fin'd						D'ble Y.	Bus Pipe	Yes	
Carter-Car							Pinned.				
Moline					In Crankcase.			Single Y.	Bus Pipe		
Wood								D'ble Y.	Bus Pipe		
Pungs-Finch								Single Y.	Single Y.	Yes	
Pierce-Racine	Carbon Steel							Single Y.	Bus Pipe		
Rambler					In Crankcase.						
Crawford								Bus Pipe	Bus Pipe		
Berliet											
Frontenac			Babbitt		In Crankcase.	Gears					
Rambler		Hand-F'ged and Fin'd.			In Crankcase.	Bevel Gears		D'ble Y.	Bus Pipe		
Deere											
Itala											
Simplicity											

THE ENGINE—*Continued*

COOLING

		AIR DRAFT		RADIATOR						PUMP		
Name	Method	Source	Fan Drive	Make	Weight in Pounds	Type	Square Feet of Surface	Water Tank	Quarts of Water	Make	Type	Drive
Ford	Waterjackets	Fan Behind Radiator		Whitlock		Honeycomb		None		Ford	Centrifugal	Gear
Holsman	Flanges on Cyl.	Fan in Flywheel	Direct									
Maxwell	Waterjackets	Movement of Vehicle		Briscoe		Honeycomb		None	12	None		
Logan	Copper Flanges	Fan on Crankshaft	Direct									
Torbensen	Flanges on Cyl.	Fans in Front	Spring Belt					None				
Maxwell	Waterjackets	Fan Behind Radiator	Spring Belt	Briscoe		Honeycomb		None	15	No		
Logan	Flanges on Cyl.	Fan in Front	Leather Belt									
Dragon	Waterjackets	Fan on Radiator	Belt	Kinsey		Finned Tubes	175	None	16	Own	Centrifugal	Gear
Lambert	Waterjackets	Fan Behind Radiator	Belt	Purcell	45	Vertical Tubes		None			Rotary Gear	Gear
Premier	Waterjackets	Fan Behind Radiator	Leather Belt	Mayo	50	Honeycomb		None		Premier	Centrifugal	Gear
Premier	Waterjackets	Fan Behind Radiator	Leather Belt	Mayo	50	Honeycomb		None		Premier	Centrifugal	Gear
Grout	Waterjackets	Fan Behind Radiator	Belt	Mayo		Honeycomb	132	None	20		Rotary Gear	Di'ct
Dorris	Waterjackets	Fan in Flywheel		Long	50	Tubular	130	No	6	Lobee	Rota y Gear	Di'ct
Smith	Waterjackets	Fan Behind Radiator	Belt	Smith	50	Vertical Tubes	97	None	12	Smith	Centrifugal	Gear
Lambert	Waterjackets	Fan Behind Radiator	Belt	Purcell	50	Vertical Tubes		None			Rotary Gear	Gear
Logan		Fan Behind Radiator	Leather Belt	Kinsey	72	Vertical Tubes		None	20		Centrifugal	Shaft
Marmon	Flanges on Cyl.	Fan	Flat Belt			None		None		None	None	None
St. Louis	Waterjackets	Fan Behind Radiator		Briscoe		Horizontal Tubes				Lobee	Rotary Gear	Gear
Wayne	Waterjackets	Fan	Spring Belt			Vertical Tubes		None			Gear	Gear
Wayne	Waterjackets	Fan	Spring Belt								Gear	Gear
Atlas	Waterjackets	Fan Behind Radiator	Belt	Whitlock	75	Honeycomb		None		None	Thermo Siphon	
Pennsylvania	Waterjackets	Fan Behind Radiator	Belt	Mayo		Honeycomb		None			Rotary Gear	Gear
Ford	Waterjackets	Fan Behind Radiator	Leather Belt	Whitlock		Honeycomb		None	7	Ford	Centrifugal	
St. Louis	Waterjackets	Fan Behind Radiator	Spring Belt	Briscoe		Honeycomb				Lobee	Rotary Gear	Gear
Atlas				Whitlock	75	Finned Tubes		Yes	48	Lobee	Centrifugal	Gear
American	Waterjackets	Fan Behind Radiator	Flat Belt		68	Vertical Tubes			20		Centrifugal	Gear
American	Waterjackets	Fan Behind Radiator	Flat Belt		58	Vertical Tubes			17		Centrifugal	Gear
Berkshire	Waterjackets			Livingstone	65	Cellular		None			Centrifugal	Gear
Commerce	Waterjackets	Fan	Belt	Kinwood		Vertical Tubes		Yes	20	None	None	None
Marmon	Flanges on Cyl.	Fan	Flat Belt	None		None		None		None	None	None
Wayne	Waterjackets	Fan Behind Radiator	Spring Belt			Honeycomb		None			Gear	Gear
Acme	Waterjackets	Fan Behind Radiator	Belt	Acme		Finned Tubes		Yes	8	Acme	Centrifugal	Gear
Acme	Waterjackets	Fan Behind Radiator	Belt	Acme		Finned Tubes		Yes	8	Acme	Centrifugal	Gear
Craig-Toledo	Waterjackets					Honeycomb			8			
Welch	Waterjackets	Fan Behind Radiator	Belt	Welch		Honeycomb	110	None	10		Centrifugal	Belt
Am. Mors	Waterjackets	Fan in Flywheel		Own	85	Finned Tubes		Yes	40	Own	Rotary Gear	Gear
Harrison	Waterjackets	Fan Behind Radiator	Spring Belt	Long		Vertical Tubes				B'kman	Centrifugal	Gear
Am. Mors	Waterjackets	None	None	Own	85	Finned Tubes		Yes	40	Own	Rotary Gear	Gear
Welch	Waterjackets	Fan Behind Radiator	Belt	Welch		Honeycomb	110	None	12		Centrifugal	Belt
Am. Napier	Waterjackets	Fan Behind Radiator	Belt	Any	?	Honeycomb	?	Yes		Own	Centrifugal	Gear
Westinghouse	Waterjackets	Fan Behind Radiator	Belt	Swiss		Honeycomb		None			Centrifugal	Gear
Panhard	Waterjackets	Fan Behind Radiator	Leather Belt	Grouville		Honeycomb		Yes		P. L.	Centrifugal	Gear
Panhard	Waterjackets	Fan Behind Radiator	Leather Belt	Grouville		Honeycomb		Yes	20	P. L.	Centrifugal	Gear
Panhard		Fan Behind Radiator	Leather Belt	Grouville		Honeycomb		Yes	20	P. L.		
Mitchell	Waterjackets	Fan Behind Radiator	Shaft			Honeycomb					Rotary Gear	Shaft
Mitchell	Waterjackets		Shaft			Honeycomb		None			Rotary Gear	Shaft
Pullman	Waterjackets											
Frayer-Miller	Airjackets	Blower	Gear	None		None		None			None	None
Compound												
Compound												
Compound												
Compound												
Mitchell	Waterjackets	Fan Behind Radiator	Shaft			Honeycomb					Rotary Gear	D'ct.
Pullman	Waterjackets											
Pullman	Waterjackets											
Triumph	Waterjackets					Horizontal Tubes		None			Rotary Gear	
National	Waterjackets	Fan Behind Radiator				Vertical Tubes					Rotary Gear	Gear
National	Waterjackets	Fan Behind Radiator				Vertical Tubes					Rotary Gear	Gear
National	Waterjackets	Fan Behind Radiator				Vertical Tubes					Rotary Gear	Gea
Detroit	Waterjackets											
Aerocar	Waterjackets					Tubular					Rotary Gear	D'ct.
Craig-Toledo	Waterjackets	Fan Behind Radiator				Honeycomb		Yes			Centrifugal	
Rainier	Waterjackets	Fan Behind Radiator	Leather Belt			Honeycomb		None			Centrifugal	Gear
Cleveland	Waterjackets	Fan Behind Radiator	Leather Belt			Honeycomb		None			Centrifugal	Gear
Compound												
Compound												
Am. Mercedes	Waterjackets	Fan Behind Radiator	Belt	Own		Honeycomb		None		Own	Centrifugal	Gear
B. L. M.	Waterjackets	Fan at Flywheel	Attached	Livingstone		Honeycomb		None		Mulet	Rotary Gear	Gear
Moore	Waterjackets	Fan Behind Radiator	Gear			Honeycomb		None			Centrifugal	Gear
Lane						Condenser		Yes				
Lane						Condenser		Yes				
Glide	Waterjackets					Honeycomb						
Glide	Waterjackets											
Glide	Waterjackets					Honeycomb						
White		Fan Behind Condenser	Chain			Condenser		Yes		Steam		
Reo	Waterjackets	Movement of Vehicle		Reo		Horizontal Tubes		Yes		Reo	Rotary Gear	D'ct.
Reo	Waterjackets	Movement of Vehicle		Reo		Horizontal Tubes		Yes			Rotary Gear	D'ct.
Zust	Waterjackets	Flywheel		Meyvet		Honeycomb		None			Centrifugal	Gear
Stod'd-D'ton	Waterjackets			Kenwood		Vertical Tubes		None		D.& M.C.	Centrifugal	Gear
Stod'd-D'ton	Waterjackets			Kenwood	85	Vertical Tubes		None		D.& M.C.	Centrifugal	Gear
Lansden												
Johnson												
Martine	Waterjackets	Flywheel and Fan	Belt			Honeycomb					Centrifugal	Gear
Am. Truck	Waterjackets	Fan Behind Radiator	Belt	Am. Truck		Vertical Tubes				Am. Tr.	Rotary Gear	Gear
Moon	Waterjackets	Flywheel				Honeycomb		None			Rotary Gear	Gear
C. G. & V.	Waterjackets	Fan in Flywheel				G. and A.		Yes	25		Centrifugal	Gear
Mercedes	Waterjackets	Fan Behind Radiator	Belt	Mercedes		Honeycomb		None	4	Mercedes	Centrifugal	Gear
Eng. Daimler	Waterjackets	Fan Behind Radiator	Belt	Eng. Daim		Vertical Tubes		Yes		Eng. D'r.	Centrifugal	Gear
Eng. Daimler	Waterjackets	Fan Behind Radiator	Belt	Eng. Daim		Vertical Tubes		Yes		Eng. D'r.	Centrifugal	Gear
Eng. Daimler	Waterjackets	Fan Behind Radiator	Belt	Eng. Daim		Vertical Tubes		Yes		Eng. D'r.	Centrifugal	Gear
Delahave	Waterjackets											
Marion	Waterjackets	Fan Behind Radiator	Spring Belt			Vertical Tubes					Rotary Gear	Gear
Austin	Waterjackets	Fan Behind Radiator	Spring Belt			Honeycomb Tubes		None			Rotary Gear	
Carter-Car	Waterjackets					Vertical Tubes					Thermo Siphon	
Moline	Waterjackets	Fan Behind Radiator	Direct			Honeycomb		None				
Wood	Waterjackets	Fan Behind Radiator	Spring Belt			Horizontal Tubes		Yes				
Pungs-Finch	Waterjackets	Fan Behind Radiator				Honeycomb		None				
Pierce-Racine	Waterjackets	Fan Behind Radiator	Spring Belt			Honeycomb					Rotary Gear	Gear
Rambler	Waterjackets											
Crawford												
Berliet	Waterjackets	Fan Behind Radiator	Spring Belt			Honeycomb		None			Centrifugal	Gear
Frontenac	Waterjackets	Fan Behind Radiator				Honeycomb						
Rambler	Waterjackets	Fan Behind Radiator	Belt			Vertical Tubes					Centrifugal	Gear
Deere	Waterjackets	Fan Behind Radiator				Honeycomb						Chain
Itala	Waterjackets					Honeycomb					Centrifugal	Gear
Simplicity	Water-ackets	Fan Behind Radiator	Spring Belt			Honeycomb		None				Belt

THE ENGINE—*Continued*

	CARBURETER			Throttle	IGNITION			COILS		
Name	Make	Feed	Adjustments	Throttle On	Type	Current Source	Plugs	Make	Units	Commutator
Ford	Holley	Float	Fuel Level, Aux. Air, Nozzle	Intake	Jump-Spark	Dry Cells	Mosler	Splitdorf	Four	Lacoste
Holsman		Float	Auxiliary Air and Nozzle	Carbureter	Jump-Spark	Dry Cells	Mica	Duplex	Two	Holsman
Maxwell	Maxwell	Float	On Fuel and Air	Carbureter	Jump-Spark	Dry Cells		Optional		
Logan	Schebler	Float	One Fuel Supply, Aux. Air	Carbureter	Jump-Spark	Storage	Comet	Splitdorf	Two	Logan
Torbensen	Schebler	Float		Carbureter	Jump-Spark	Combination	Rajah	Autocoil	Two	
Maxwell	Maxwell	Float	On Fuel and Air	Carbureter	Jump-Spark	Dry Cells		Optional		
Logan	Universal	Float	On Fuel and Auxiliary Air	Carbureter	Jump-Spark	Storage	Spitfire	Splitdorf	Four	Herz
Dragon	Holley	Float	Fuel Level, Auxiliary Air	Carbureter	Jump-Spark	Combination	Breechblock	Holley	Four	Splitdorf
Lambert	Schebler	Float	On Fuel Level	Carbureter	Jump-Spark	Storage	Mosler	Splitdorf	Four	
Premier	Schebler	Float		Carbureter	Jump-Spark	Combination	Rajah	Splitdorf	Four	Pittsfield
Premier	Schebler	Float		Carbureter	Jump-Spark	Combination	Rajah	Splitdorf	Four	Pittsfield
Grout	Holley	Float	Fuel Level, Aux. Air, Nozzle	Carbureter	Jump-Spark	Dry Cells	Rajah	Connecticut	One	Grout
Dorris	Breeze	Float	Fuel Level, Aux. Air, Nozzle	Carbureter	Jump-Spark	Dry Cells	Spitfire	Splitdorf	Four	Lacoste
Smith	Smith	Float	Adjst. for High Speed Only	Carbureter	Jump-Spark	Combination	Soot Proof	Splitdorf	Four	Smith
Lambert	Schebler	Float	On Fuel Level	Carbureter	Jump-Spark	Storage	Mosler	Splitdorf	Four	
Logan	Schebler	Float	Nozzle and Auxiliary Air	Carbureter	Jump-Spark	Storage	Comet	Splitdorf	Two	Milwaukee
Marmon	Holley	Float	Fuel Level, Aux. Air, Nozzle	Carbureter	Jump-Spark	Combination	Comet	Connecticut	Four	Lacoste
St. Louis	Breeze	Float	Auxiliary Air, and Nozzle	Carbureter	Jump-Spark	Combination		Splitdorf	Four	Splitdorf
Wayne				Carbureter	Jump-Spark	Storage				
Wayne										
Atlas	Kingston	Float		Intake	Jump-Spark	Battery		Connecticut	Two	Splitdorf
Pennsylvania	Schebler	Float	Fuel Level, Auxiliary Air	Carbureter	Jump-Spark	Storage				
Ford	Kingston	Float	Fuel Level, Aux. Air, Nozzle	Intake	Jump-Spark	Combination	Double Set		Six	Lacoste
St. Louis	Breeze	Float		Carbureter	Jump-Spark	Combination		Splitdorf	Four	Splitdorf
Atlas	Knox	Float		Hand Control	Jump Spark	Dry Cells	Soot Proof	Connecticut		Knox
American		Float	Air and Nozzle	Carbureter	Jump-Spark	Combination			Four	
American		Float	Air and Nozzle	Carbureter	Jump-Spark	Combination			Four	
Berkshire	Schebler	Float	Auxiliary Air and Nozzle	Carbureter	Jump-Spark	Magneto	Oleo	Pittsfield	Four	Lacoste
Commerce	Special	Float	On Fuel Level	Carbureter	Jump-Spark	Combination	Imported	Heinze	Four	Heinze
Marmon	Holley	Float	Fuel Level, Air, Nozzle	Carbureter	Jump-Spark	Combination	Comet	Connecticut	Four	Pittsfield
Wayne										
Acme	Schebler			Carbureter	Jump-Spark	Magneto				
Acme	Schebler			Carbureter	Jump-Spark	Magneto				
Craig-Toledo	Buffalo				Jump-Spark	Combination				
Welch		Float	Fuel Level, Nozzle and Air	Carbureter	Jump-Spark	Combination	Rajah	Optional	Four	Welch
Am. Mors	Mors	Float	Main Air and Aux. Air	Carbureter	Both	Combination	Am. Mors	Herz	Four	Herz
Harrison	Buffalo	Float	On Throttle Opening	Carbureter	Jump-Spark	Storage	Splitdorf	Connecticut	Four	Herz
Am. Mors	Mors	Float	Main Air and Auxiliary Air	Carbureter	Both	Combination		Herz	Four	Herz
Welch	Buffalo	Float	Fuel Level, Nozzle and Ai	Carbureter	Jump-Spark	Combination	Rajah	Optional	Four	Welch
Am. Napier	Westinghouse	Float	On Air	Intake	Jump-Spark	Combination	Optional	Optional	One	Am. Napier
Westinghouse	Westinghouse	Float	Air and Main Air	Intake	Make and Br'k	Combination				
Panhard	Krebs	Float		Carbureter	Jump-Spark	Magneto		Eiseman		P. L.
Panhard	Krebs	Float		Carbureter	Jump-Spark	Magneto		Eiseman		P. L.
Panhard	Krebs	Float		Carbureter	Jump-Spark	Magneto		Eiseman		P. L.
Mitchell		Float		Carbureter	Jump-Spark				Four	
Mitchell		Float		Carbureter	Jump-Spark				Four	
Pullman		Float		Carbureter	Jump-Spark	Combination				
Frayer-Miller	Frayer-Miller			Carbureter	Jump-Spark	Dry Cells			Four	
Compound										
Compound										
Compound										
Compound										
Mitchell		Float		Carbureter	Jump-Spark					
Pullman					Jump-Spark	Storage Cells				
Pullman					Jump-Spark	Combination				
Triumph	Triumph	Float		Carbureter	Jump-Spark	Combination				
National	Schebler	Float	Fuel Level, Aux Air, Nozzle	Carbureter	Jump-Spark	Combination			One	Splitdorf
National	Schebler	Float	Fuel Level, Aux. Air. Nozzle	Carbureter	Jump-Spark	Combination			One	
National	Schebler	Float	Fuel Level, Aux. Air, Nozzle	Carbureter	Jump-Spark	Combination			Four	
Detroit				Carbureter	Jump-Spark			Heinze		
Aerocar		Float		Carbureter	Jump-Spark	Combination			Four	
Craig-Toledo		Float	Fuel Level, Aux. Air, Nozzle	Carbureter	Jump-Spark	Combination				
Rainier		Float		Carbureter	Make and Br'k	Magneto				
Cleveland		Float		Carbureter	Make and Br'k	Magneto				
Compound										
Compound										
Am. Mercedes	Von Soden	Float	Fuel Level, Aux. Air, Nozzle	Carbureter	Make and Br'k	Magneto				
B. L. M.	Xenia	Float	Fuel Level, Aux Air, Nozzle	Carbureter	Jump-Spark	Magneto	Poignon			
Moore	Moore	Float		Carbureter	Jump-Spark	Combination			Four	
Lane				Under S. Wh.						
Lane				Under S. Wh.						
Glide	Schebler	Float	Fuel Level, Aux. Air, Nozzle	Carbureter	Jump-Spark	Storage Cells			Four	
Glide					Jump-Spark	Optional				
Glide					Jump-Spark					
White	White						Fuel Burner			
Reo	2 Reo	Float	Fuel Level, Air, Nozzle	Carbureter	Jump-Spark	Dry Cells	Soot Proof	National	Two	
Reo	Reo	Float	Fuel Level, Air. Nozzle	Carbureter	Jump-Spark	Dry Cells	Soot Proof	National	One	
Zust	Zust	Float	Fuel Level and Air	Carbureter	Make and Br'k	Magneto				
Stoddard Dayton	Schebler	Float	Fuel Level, Aux. and Nozzle	Carbureter	Jump-Spark	Storage		Splitdorf	Four	D. M. C. Co.
Stoddard Dayton	Schebler	Float	Fuel Level, Aux. Air, Nozzles	Carbureter	Jump-Spark	2 Storage		Splitdorf	Four	D. M. C. Co.
Lansden										
Johnson								Fuel Burner		
Martine		Float		Automatic	Make and Br'k	Magneto				
Am. Truck		Float	Fuel Level, Aux. Air	Carbureter	Jump-Spark	Combination		Splitdorf	Four	Splitdorf
Moon	Universal	Float	Fuel Level	Carbureter	Jump-Spark	Storage Cells		Heinze	Four	
C. G. & V.	Gaither	Float	Fuel Level	Carbureter	Jump-Spark	Combination				
Mercedes	Mercedes	Float	Auxiliary Air and Nozzle	Carbureter	Make and Br'k	Magneto				
English Daimler	Eng. Daimler	Float	Both	Carbureter	Jump-Spark	Combination			Four	
English Daimler	Eng. Daimler	Float	Both	Carbureter	Jump-Spark	Combination			Four	
English Daimler	Eng. Daimler	Float	Both	Carbureter	Jump-Spark	Combination			Four	
Delahaye	Delahaye			Carbureter	Jump-Spark	Magneto				
Marion	Schebler	Float	On Fuel Level, Auxiliary Air	On Carb'ter	Jump-Spark	Storage		Ra ah	Four	Herz
Austin				On Carb'ter		Magneto				
Carter-Car					Jump-Spark	Dry Cells			Four	Splitdorf
Moline		Float			Jump-Spark	Storage Cells				
Wood		Float		On Carb'ter		Storage Cells			Four	
Pungs-Finch	Schebler	Float	On Fuel Level, Auxiliary Air	On Carb'ter	Jump-Spark	Storage Cells			Four	
Pierce-Racine	Holley	Float	On Fuel Level	On Carb'ter	Jump-Spark	Storage Cells	Soot Proof	Lecoste	Four	
Rambler			On Fuel Level	On Carb'ter	Jump-Spark	Dry Cells			Two	
Crawford	Rambler	Float								
Berliet				On Carb'ter	Make and Br'k	Magneto				
Frontenac		Float								
Rambler		Float	On Fuel Level	On Carb'ter	Jump-Spark	Storage Cells				
Deere	Rambler	Float			Jump-Spark	Storage Cells			Four	
Itala		Float	On Fuel Level, Aux. Air, Noz.		Make and Br'k	Magneto			Four	
Simplicity		Float								

LUBRICATION

Name	Grease Cups	RESERVOIR SYSTEM: Feed By	Pipe Leads to	Splash Lubrication
Ford	Everywhere	Exhaust Pressure	Engine Base and Universal Joint	Crankcase, Gearcase
Holsman	Countershaft, Steering Pivots	Individual Force Pump	Cylinder and Crankcase	Crankcase
Maxwell	On Rear Axle	Air Pressure	Engine Bearings, Two Cylinder	
Logan	None	Ratchet	Mainshaft Bearings	
Torbensen		Crankcase Pressure	Engine Bearings and Cylinders	Gearcase
Maxwell	One on Rear Axle	Air Pressure	Engine Bearings, Gear Box	
Logan	One on Clutch	Mechanical Oiler	Crank Pits	Crankcase
Dragon	Springs, Knuckles, Clutch	Lavigne Oiler	Crankcase and Transmission	Crankcase, Gearcase, Rear Axle
Lambert		Individual-Pump Pressure	Engine Bearings, Cylinders	Crankcase
Premier	Wheels, Pivots	Hill Oiler	Two Cylinders	Crankcase, Transmission Case
Premier	Wheels, Pivots	Hill Oiler		Crankcase, Transmission Case
Grout	Countershaft Boxes	Single Pump Seven Feed	Cylinders and Crankcase	Crankcase, Gearcase
Dorris		Individual Pump	Cylinders	Crankcase, Gearcase, Diff
Smith	Pump, Ball Joint	Individual Pump	Cylinders	Crankcase, Gearcase, Diff
Lambert		Individual-Pump Pressure	Engine Bearings, Cylinders	Crankcase
Logan	None	Chain Drive	All Engine Bearings	
Marmon	Steering and Frame Parts	Gear Pump	Hollow Crankcase	Gearcase, Rear Axle
St. Louis		Pump Pressure	Engine Bearings, Cylinders	Crankcase, Gearcase
Wayne		Individual Force Feed	Engine Bearings and Change Gear	Crankcase, Gearcase
Wayne				
Atlas	Wheels and Steering Pivots	Force	Cylinders, Engine Bearings	Clutch, Trans. Case, Diff. Case
Pennsylvania		Individual Pump	Engine Bearings, Crankcase	Crankcase, Gearcase
Ford	Everywhere	Individual-Pump Pressure	Cylinders	Crankcase, Gearcase, Diff
St. Louis		Individual-Pump Pressure	Engine Bearings, Cylinders	
Atlas	Crankshaft, Pump, Pivot			Crankcase
American	Pump and Clutch Bearing	Individual Pump	Cyls., Crankcase, Rear System	Crankcase, Trans. Case
American	Pump and Clutch Bearing	Individual Pump	Cyls., Crankcase, Rear System	Crankcase, Trans. Case
Berkshire	Strut Rod and Steering Gear	Gear Pump	Gear Pump	
Commerce	Wheels and Steering Pivots	Pump Pressure	Engine Bearings, Crankcase	Crankcase, Trans. Case
Marmon	Control and Frame Connections	Gear Pump	Hollow Crankcase	Gearcase, Rear Axle
Wayne				
Acme	Springs and Steering Pivots	Force Feed	Crankcase	Crankcase, Gearcase, Diff
Acme	Springs and Steering Pivots	Force Feed	Crankcase	Crankcase, Gearcase, Diff
Craig Toledo				Crankcase, Gearcase, Diff
Welch	Steering Knuckles and Fan Hub	Individual-Pump Pressure	Cylinders, Crankcase	Crankcase, Gearcase, Diff
Am. Mors	Everywhere	Force Feed	Crankcase	Crankcase, Gearcase, Diff
Harrison	Wheels, Springs and Steering Pivots	Individual-Pump Pressure	Engine Bearings, Cylinders	Crankcase, Gearcase, Diff
Am. Mors	Everywhere	Pump Pressure	Cylinders, Crankcase	Crankcase, Gearcase, Diff
Welch	Steering Knuckle and Fan Hub	Individual-Pump Pressure	Cylinders, Crankcase	Crankcase, Gearcase, Diff
Am. Napier	Pivots, Springs, Clutch, Pump	Pump Pressure	Engine Bearings	
Westinghouse	Steering, Clutch, Pump	Individual Pump	Engine Bearings, Crankcase	Crankcase, Gearcase, Diff
Panhard		Pump Pressure	Cylinders, Change-Speed Gear	
Panhard		Pump Pressure	Cylinders, Change-Speed Gear	
Panhard		Pump Pressure	Cylinders, Change-Speed Gear	
Mitchell		Individual-Pump Pressure	Cylinders	Crankcase, Gearcase, Diff'ntial
Mitchell		Individual-Pump Pressure	Cylinders	Gearcase, Differential
Pullman				Crankcase, Gearcase, Diff'ential
Frayer-Miller		Individual-Pump Pressure		
Compound				
Compound				
Compound				
Compound				
Mitchell		Individual-Pump Pressure	Cylinders	
Pullman				
Pullman				
Triumph		Individual-Pump Pressure		Crankcase, Gearcase, Diff'ntial
National		Individual-Pump Pressure	Clutch and Rear System	Gearcase, Diff., Steering Gear
National		Individual-Pump Pressure	Clutch and Rear System	Gearcase, Diff., Steering Gear
National		Individual-Pump Pressure	Clutch and Rear System	Crankcase, Gearcase, Diff'ntial
Detroit				
Aerocar			Cylinders	Gearcase, Diff., Rear Axle
Craig-Toledo		Automatic		
Rainier		Individual-Pump Pressure	Engine Bearings, Change-Sp'd G'r	
Cleveland		Individual-Pump Pressure	Engine Bearings, Ch.-Sp'd Gear	
Compound				
Compound				
Am. Mercedes	On Wheels, Steering Pivots	Individual-Pump Pressure	Cylinders	Gearcase, Differential
B. L. M.		Gear Pump	Engine	Crankcase, Gearcase
Moore		Gravity	Crankcase	Crankcase, Gearcase, Differ'tial
Lane				
Lane				
Glide		Individual-Pump Pressure	Crankcase	
Glide				
Glide		Individual-Pump Pressure		
White				
Reo	On Wheels	Individual-Pump Pressure	Cylinders	Crankcase, Gearcase, Diff'ntial
Reo	On Wheels	Gravity	Cylinders	Crankcase, Gearcase, Diff'ntial
Zust	Front Wheels	Individual Pump Pressure	Cylinders	Crankcase
Stoddard-Dayton	Steering Gear, etc		Engine Bearings	Crankcase
Stoddard-Dayton	Steering Gear, etc	Spring Pressure	Engine Bearings	Crankcase
Lansden				
Johnson				
Martine	Wheels, Springs, etc			Crankcase
Am. Truck	Wheels, Springs, etc	Individual Pump Pressure	Cylinders	Crankcase
Moon		Individual-Pump Pressure		
C. G. & V.		Pump		
Mercedes	Springs and Steering Pivots	Individual-Pump Pressure	Cylinders	Crankcase
English Daimler		Individual Pump Pressure	Cylinders	Gearcase
English Daimler		Individual Pump Pressure	Cylinders	Gearcase
English Daimler		Individual Pump Pressure	Cylinders	Gearcase
Delahaye		Individual Pump Pressure		
Marion	On Wheels	Force and Splash	Cylinders, Change-Speed Gear, etc.	In Crankcase, Gearcase
Austin		Individual-Pump Pressure		In Crankcase
Carter-Car	Steering Pivots	Gravity		
Moline		Hill Oiler	Engine Cylinders, Etc	
Wood	Wheels, Springs, etc	Exhaust Pressure		
Pungs-Finch	Wheels, Steering Pivots			
Pierce-Racine		Individual-Pump Pressure	Engine Cylinders, Etc	Crankcase, Gearcase, Diff'ntial
Rambler				
Crawford				
Berliet		Individual-Pump Pressure		
Frontenac				
Rambler		Individual-Pump Pressure	Cylinders	Crankcase, Gearcase, Diff'ntial
Deere		Individual-Pump Pressure		
Itala		Individual-Pump Pressure		
Simplicity				

THE TRANSMISSION

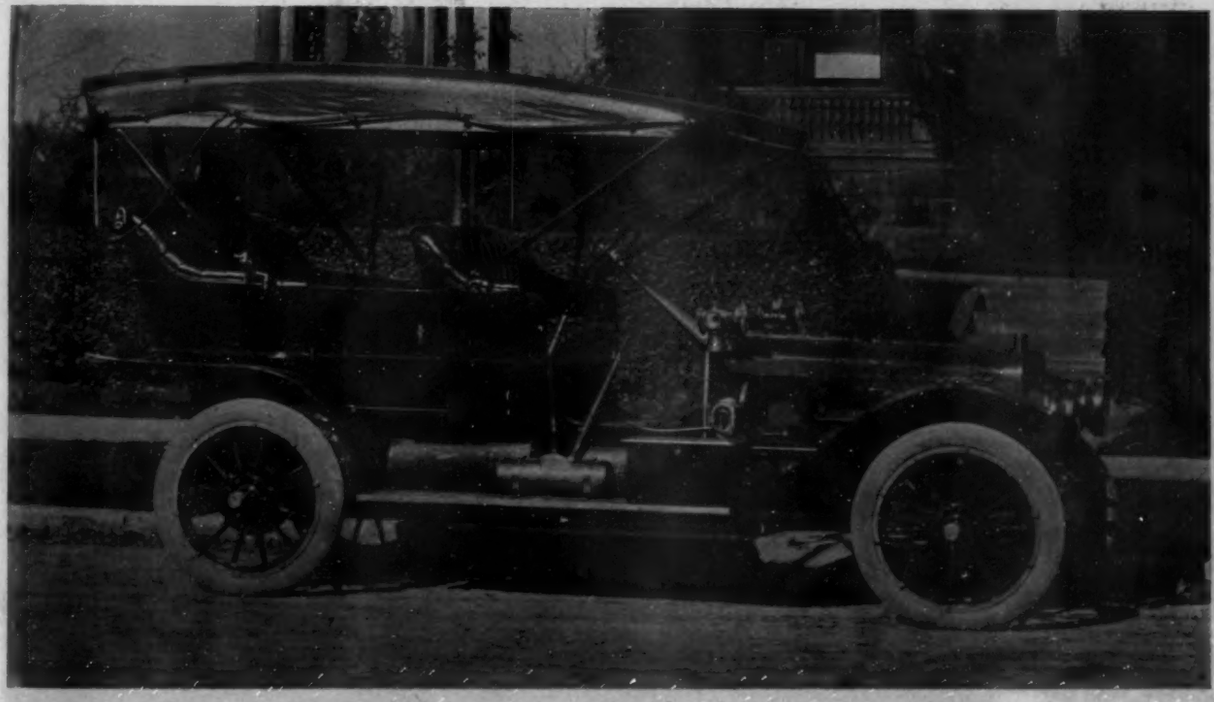
CHANGE-SPEED GEAR

Name	Type	Speeds	Ratio of Engine Rotations to 1 Rear Wheel Rotation, on High to Low Speeds, and on Reverse					Bearings	Material	Location	Control By
			1st	2d	3d	4th	R				
Ford	Planetary-Gear	2 Forward, 1 Reverse	3–1	7½–1				Babbitted	Nickel Steel	Extension Cr'kcase.	Progressive & Pedal.
Holsman	Holsman Special	2 Forward, 1 Reverse						Hyatt			
Maxwell	Planetary-Gear	2 Forward, 1 Reverse	3½					Bronze		Extension Cr'kcase.	Single Lever
Logan	Sliding-Gear	2 Forward, 1 Reverse						Bronze	Carbon Steel	Amidships	Straightaway Lever.
Torbensen	Planetary-Gear	2 Forward, 1 Reverse	8½	26			26	Hess-Bright	Carbon Steel	On Rear Axle	Progressive & Pedal.
Maxwell	Sliding Gear	3 Forward, 1 Reverse	3½					Plain & Hyatt		Extension Cr'kcase.	Progressive
Logan	Sliding-Gear	2 Forward, 1 Reverse	2.04	6			6	Timkin	Chrome-Nickel Steel	On Rear Axle	Straightaway Lever.
Dragon	Sliding-Gear	3 Forward, 1 Reverse	5/14	7/10	1.1		¼	Bronze	3% Nickel Steel	Amidships	Progressive Lever
Lambert	Friction Disk	Infinity						Roller			
Premier	Sliding-Gear	3 Forward, 1 Reverse	3	5.6	10.7		13.7	Hess-Bright	Carbon Steel	Amidships	Selective Lever
Premier	Sliding-Gear	3 Forward, 1 Reverse	3.5	6.6	12.5		16.	Hess-Bright	Carbon Steel	Amidships	Selective Lever
Grout	Sliding-Gear	3 Forward, 1 Reverse	3.3	7	14.7		16.	Bronze	Chrome-Nickel Steel	Amidships	Straightaway Lever.
Dorris	Sliding-Gear	3 Forward, 1 Reverse			3.1			Bronze	Chrome-Nickel Steel	Extension Cr'kcase.	Straightaway Lever.
Smith	Sliding-Gear	3 Forward, 1 Reverse	3	5.4	11.3		16.8	Timken	Carbon-Steel	Rear Axle	
Lambert	Friction Disk	Infinity						Roller			Hand Lever
Logan	Sliding-Gear	2 Forward, 1 Reverse						Ball & Roller	Chrome-Nickel Steel	Amidships	Progressive
Marmon	Planetary-Gear	2 Forward, 1 Reverse	4	11.1			12	Bronze	Chrome-Nickel Steel	Amidships	Pedal Reverse
St. Louis	Sliding-Gear	3 Forward, 1 Reverse	3.1	5.1	8½		6	Bronze	Carbon Steel	Extension Cr'kcase.	Straightaway Lever.
Wayne	Sliding-Gear	3 Forward, 1 Reverse						Bronze	Chrome-Nickel Steel	On Rear Axle	Selective Lever
Wayne	Sliding-Gear	3 Forward, 1 Reverse								Extension Cr'kcase.	Straightaway Lever.
Atlas	Sliding-Gear	3 Forward, 1 Reverse						Roller	Chrome-Nickel	Amidships	Progressive
Pennsylvania	Sliding-Gear	3 Forward, 1 Reverse	3.1	5½	9		10	Annular Ball	Carbon Steel	Amidships	Selective Lever
Ford	Planetary-Gear	2 Forward, 1 Reverse	3–3½	7½				Babbitted & Br'ze	Chrome-Nickel Steel	Amidships	Progressive
St. Louis	Sliding-Gear	3 Forward, 1 Reverse							Carbon Steel	Extension Cr'kcase.	Selective Lever
Atlas	Sliding-Gear	3 Forward, 1 Reverse						Timken Roller	Carbon Steel	Extension Cr'kcase.	
American	Sliding-Gear	3 Forward, 1 Reverse						Annular Ball	Carbon Steel	Amidships	Progressive Lever
American	Sliding-Gear	3 Forward, 1 Reverse						Annular Ball	Carbon Steel	Amidships	Progressive Lever
Berkshire	Individual-Clutch	3 Forward, 1 Reverse	3	5.2	9.6		8.6	Hess-Bright	Steel & Bronze	Amidships	Straightaway Lever.
Commerce	Sliding-Gear	3 Forward, 1 Reverse						American Roller	Chrome-Nickel Steel	Amidships	Selective Lever
Marmon	Sliding-Gear	3 Forward, 1 Reverse						Annular Ball	Chrome-Nickel Steel	Amidships	Selective Lever
Wayne	Sliding-Gear	3 Forward, 1 Reverse								Amidships	Straightaway Lever.
Acme	Sliding-Gear	3 Forward, 1 Reverse						Annular Ball	Carbon Steel	Amidships	Straightaway Lever.
Acme	Sliding-Gear	4 Forward, 1 Reverse						Annular Ball	Chrome-Nickel Steel	Amidships	Selective Lever
Craig-Toledo	Sliding-Gear	3 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Progressive Lever
Welch	Individual-Clutch	3 Forward, 2 Reverse						Babbitted Bronze	Carbon Steel	Amidships	Selective, Pedal
Am. Mors	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Progressive
Harrison	Sliding-Gear	3 Forward, 1 Reverse	1.1	2.1	4.1			Bronze	Chrome-Nickel Steel	Amidships	Selective Lever
Am. Mors	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Straightaway Lever.
Welch	Individual-Clutch	3 Forward, 2 Reverse						Babbitted Bronze	Carbon Steel	Amidships	Selective, Pedal
Am. Napier	Sliding-Gear	3 Forward, 1 Reverse						Hess-Bright	Alloy Steel	Amidships	Selective Lever
Westinghouse	Sliding-Gear	4 Forward, 1 Reverse	3.1		2.1			Hess-Bright		Amidships	Selective Lever
Panhard	Sliding-Gear	4 Forward, 1 Reverse						Malicet & Blin	Chrome-Nickel Steel		Selective Lever
Panhard	Sliding-Gear	4 Forward, 1 Reverse						Malicet & Blin	Chrome-Nickel Steel		Selective Lever
Panhard	Sliding-Gear	4 Forward, 1 Reverse						Malicet & Blin	Chrome-Nickel Sttel		Selective Lever
Mitchell	Sliding-Gear	3 Forward, 1 Reverse									Straightaway Lever.
Mitchell	Sliding-Gear	3 Forward, 1 Reverse						Plain		Amidships	Straightaway Lever.
Pullman	Sliding-Gear	3 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Progressive
Frayer-Miller	Sliding-Gear										
Compound	Sliding-Gear	3 Forward, 1 Reverse									
Compound	Sliding-Gear	3 Forward, 1 Reverse									
Compound		3 Forward, 1 Reverse									
Compound	Sliding Gear	3 Forward, 1 Reverse									
Mitchell	Sliding-Gear	3 Forward, 1 Reverse						Plain		Amidships	Straightaway Lever.
Pullman	Sliding-Gear	3 Forward, 1 Reverse						Imported Roller	Chrome-Nickel Steel		Selective Lever
Pullman	Sliding-Gear	3 Forward, 1 Reverse							Chrome-Nickel Steel		Selective Lever
Triumph	Sliding-Gear	3 Forward, 1 Reverse									Selective Lever
National	Sliding-Gear	3 Forward, 1 Reverse						Hess-Bright			Selective Lever
National	Sliding-Gear	3 Forward, 1 Reverse						Annular Ball			Selective Lever
National	Sliding-Gear	3 Forward, 1 Reverse						Annular Ball			Progressive Lever
Detroit	Sliding-Gear	3 Forward, 1 Reverse							Chrome-Nickel Steel	Amidships	Selective Lever
Aerocar	Sliding-Gear	3 Forward, 1 Reverse									
Craig-Toledo	Sliding-Gear	3 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel		Progressive Lever
Rainier	Sliding-Gear	3 Forward, 1 Reverse						Ground Steel	Carbon Steel	Amidships	
Cleveland	Sliding-Gear	3 Forward, 1 Reverse							Carbon Steel	Amidships	Pedal Reverse
Compound	Sliding-Gear	3 Forward, 1 Reverse									
Compound	Sliding-Gear	4 Forward, 1 Reverse									
Am. Mercedes	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Selective Lever
D. L. M.	Sliding-Gear	3 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Progressive Lever
Moore	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Selective Lever
Lane											
Lane											
Glide	Sliding-Gear	3 Forward, 1 Reverse								On Rear Axle	Selective Lever
Glide	Sliding-Gear									On Rear Axle	Selective Lever
Glide											
White											
Reo									Carbon Steel	Amidships	Prog. R Rev. Lever.
Reo									Carbon Steel	Amidships	Lever and Pedal
Zust	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Selective Lever
Stoddard D'ton	Sliding-Gear	3 Forward, 1 Reverse						Timken		Amidships	Selective Lever
Stoddard D'ton		3 Forward, 1 Reverse	3.1	4.1	7.1		11.1	Timken		Amidships	Selective Lever
Lansden		4 Forward, 1 Reverse									
Johnson	Sliding-Gear	Infinity						Babbitted			Throttle
Martine	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Selective Lever
Am. Truck	Planetary-Gear	2 Forward, 1 Reverse						Bronze	Machine Steel	Amidships	Lever and Pedal
Moon	Sliding-Gear	4 Forward, 1 Reverse						Babbitted	Chrome-Nickel Steel		Selective Lever
C. G. R. V.	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Straightaway Leve.
Mercedes	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Selective Lever
English Daimler	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Selective Lever
English Daimler	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Selective Lever
English Daimler	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Selective Lever
Delahaye	Sliding-Gear									Amidships	Selective Lever
Marion	Sliding-Gear	2 Forward, 1 Reverse						Hyatt	Chrome-Nickel Steel	Amidships	Straightaway Lever.
Austin									Chrome-Nickel Steel	Amidships	Straightaway Lever.
Carter-Car	Friction-Disks	Infinity									
Moline	Sliding	2 Forward, 1 Reverse									
Wood	Sliding-Gear	3 Forward, 1 Reverse									
Pungs-Finch											
Pierce-Racine	Sliding-Gear	3 Forward, 1 Reverse						Ball		Amidships	Progressive
Rambler	Planetary-Gear	2 Forward, 1 Reverse								Rear Axle	Lever in Pedal
Crawford											Pedal
Berliet	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Selective
Frontenac	Sliding-Gear	3 Forward, 1 Reverse									Selective
Rambler	Sliding-Gear	3 Forward, 1 Reverse									Progressive
Deere	Individual Clutch	3 Forward, 1 Reverse							Chrome-Nickel Steel		
Itala	Sliding-Gear	4 Forward, 1 Reverse						Hess-Bright	Chrome-Nickel Steel	Amidships	Selective
Simplicity	Friction Disks	Infinity						Roller		Amidships	Progressive

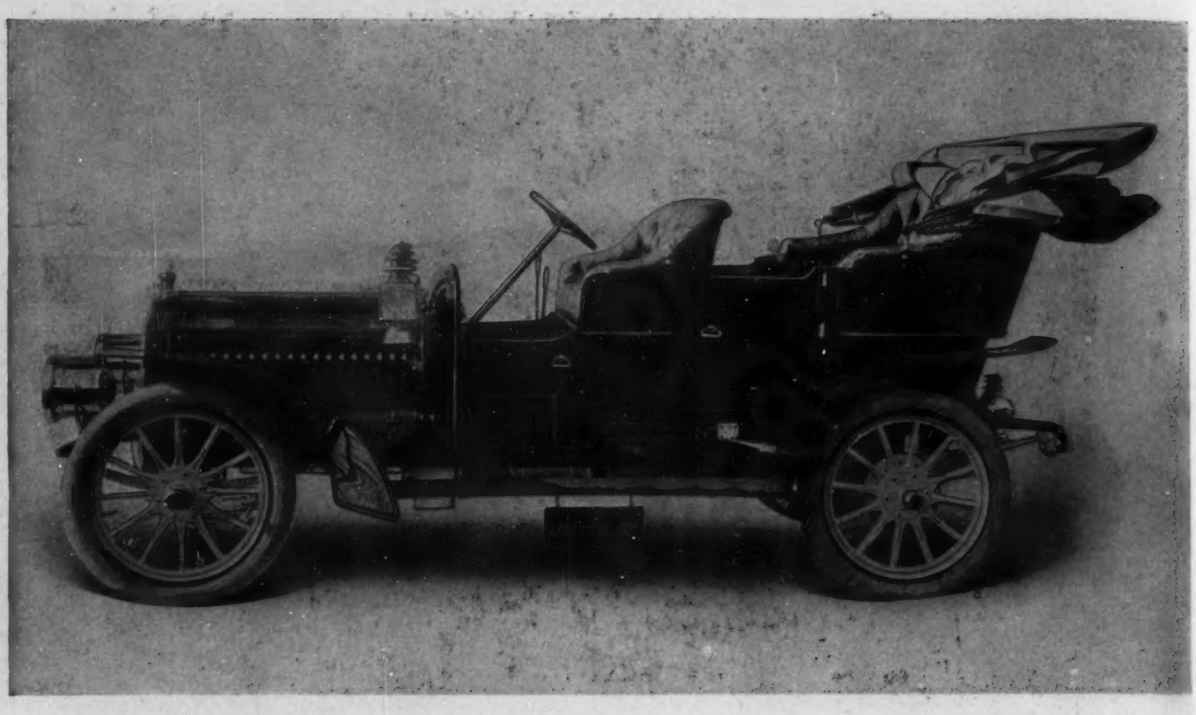
THE TRANSMISSION—*Continued*

	CLUTCH				DIFFERENTIAL		FINAL DRIVE		
Name	Type	Material of Friction Surfaces	Remarks	Operated By	Located On	Type	Type	Ratio of Sprockets or Gears	Universal Joints
Ford	Multiple Disk	Fiber to Castiron	In Oil	Lever	Rear Axle	Bevel-Pinion	Propeller-Shaft	3–1	2 in Prop. Shaft
Holsman	None	None	None	None	None	None	Steel Rope		
Maxwell	Disk	Steel to Steel	In Gearcase	Lever	Rear Axle	Spur-Pinion	Propeller-Shaft	3½–1	2 in Prop. Shaft
Torbensen	Expanding	Iron to Iron	In Flywheel	Hand Lever	Rear Axle	Spur-Pinion	Single-Chain		
Maxwell	Disk	Steel to Steel	In Gearcase	Lever	Jackshaft	Spur-Pinion	Propeller-Shaft		
Logan	Expanding	Bronze to Castiron	In Flywheel	Push Pedal	Rear Axle	Spur-Pinion	Propeller-Shaft	3½–1	2 in Prop. Shaft
Dragon	Cone	Leather to Steel		Push Pedal	Rear Axle	Bevel-Pinion	Propeller-Shaft		1 in Prop. Shaft
Lambert					Rear Axle	Bevel-Pinion	Propeller-Shaft	3½–1	3 in Prop. Shaft
Premier	Disk	Bronze to Steel	In Oil	Push Pedal	Rear Axle	Bevel-Pinion	Propeller-Shaft	2.1–1	None
Premier	Disk	Bronze to Steel	In Oil	Push Pedal	Rear Axle	Spur-Pinion	Propeller-Shaft	3	2 in Prop. Shaft
Grout	Cone	Leather to Castiron		Push Pedal	Rear Axle	Spur-Pinion	Propeller-Shaft	3.5	2 in Prop. Shaft
Dorris	Disk	Bronze to Castiron	10 Disks	Push Pedal	Jackshaft	Bevel-Pinion	Double-Chain	1.5	1 in Clutch Shaft
Smith	Multiple Disk	Bronze to Steel	In Gearcase	Optional	Rear Axle	Spur-Pinion	Propeller-Shaft	3–1	2 in Prop. Shaft
Lambert					Rear Axle	Spur-Pinion	Propeller-Shaft	3–1	2 in Prop. Shaft
Logan	Constricting Band	Gandy Belting	In Flywheel	Push Pedal	Jackshaft	Spur-Pinion	Double-Chain	3–1	
Marmon	Double Cone	Bronze to Steel	In Oil	Side Lever	Jackshaft	Bevel-Pinion	Double-Chain		1 in Prop. Shaft
St. Louis	Disk	Bronze to Steel	In Gearcase	Push Pedal	Rear Axle	Spur-Pinion	Propeller-Shaft	4	None
Wayne	Expanding	Leather to Castiron		Push Pedal	Rear Axle	Bevel-Pinion	Propeller-Shaft	3–1	2 in Prop. Shaft
Wayne	Disk	Leather to Steel	In Oil	Push Pedal	Rear Axle	Spur-Pinion	Propeller-Shaft		2 in Prop. Shaft
Atlas	Multiple Disk	Steel to Steel	In Oil	Push Pedal	Rear Axle		Propeller-Shaft		2 in Prop. Shaft
Pennsylvania	Cone	Leather to Castiron		Push Pedal	Rear Axle	Spur-Gear			1 in Prop. Shaft
Ford	Multiple Disk	Fiber to Castiron	In Oil	Lever	Rear Axle	Bevel-Pinion	Propeller-Shaft		1 Prop. 2 Clutch
St. Louis	Disk	Bronze to Steel		Push Pedal	Rear Axle	Bevel-Pinion	Propeller-Shaft	1–3	1 in Prop. Shaft
Atlas	Cone	Leather to Castiron	Outside	Push Pedal	Rear Axle	Spur-Pinion	Propeller-Shaft		2 in Prop. Shaft
American	External Cone	Leather to Castiron		Push Pedal	Rear Axle	Bevel-Pinion	Spur-Gear		
American	External Cone	Leather to Castiron		Push Pedal	Rear Axle	Spur-Gear	Propeller-Shaft	2.5–1	2 in Prop. Shaft
Berkshire	Disk	Leather to Castiron		Push Pedal	Rear Axle	Spur-Gear	Propeller-Shaft		2 in Prop. Shaft
Commerce	3 Disks	Bronze to Steel	50 Disks	Push Pedal	Jackshaft	Spur-Pinion	Double-Chain	38/46	2 in Clutch Shaft
Marmon	3 Plate Disk	Bronze to Castiron	In Flywheel	Push Pedal	Jackshaft	Spur Gear	Double-Chain	3.1	2 in Clutch Shaft
Wayne	Cone	Cork to Steel	In Oil	Push Pedal	Rear Axle	Spur-Pinion	Propeller-Shaft	3½	
Acme	Cone	Leather to Castiron		Push Pedal	Rear Axle	Bevel-Pinion	Propeller-Shaft		2 in Prop. Shaft
Acme	Cone	Leather to Castiron		Press Pedal	Jackshaft	Bevel-Pinion	Double-Chain	1.25	
Craig-Toledo	Multiple Disk	Leather to Castiron		Press Pedal	Jackshaft	Bevel-Pinion	Double-Chain	2	
Welch	Multiple Disk								None
Am. Mors	Cone	Bronze to Steel	In Oil	Hand Lever	Rear Axle	Spur-Pinion	Propeller-Shaft		1 in Prop. Shaft
Harrison	Four Jaw	Leather to Steel		Push Pedal	Jackshaft	Bevel-Pinion	Double-Chain		2 in Clutch Shaft
Am. Mors	Cone	Leathe to Castiron	In Oil	Press Pedal	Rear Axle	Bevel-Pinion	Propeller-Shaft	3.1	2 in Prop. Shaft
Welch	Multiple Disk	Leather to Castiron		Push Pedal	Jackshaft	Bevel-Pinion	Double-Chain		2 in Clutch Shaft
Am. Napier	Cone	Bronze to Steel	In Oil	Hand Lever	Rear Axle	Spur-Pinion	Propeller-Shaft		1 in Prop. Shaft
Westinghouse	Multiple Disk	Metal to Metal		Push Pedal	Rear Axle	Spur-Pinion	Propeller-Shaft	3–1	1 in Prop. Shaft
Panhard	Disk	Steel to Steel	In Oil	Push Pedal	Jackshaft	Bevel-Pinion	Double-Chain		2 in Clutch Shaft
Panhard	Disk	Steel	50 Disk	Push Pedal	Jackshaft	Bevel-Pinion	Double-Chain	2	
Panhard	Disk	Steel	50 Disk	Push Pedal	Jackshaft	Bevel-Pinion	Double-Chain	2	
	Disk	Steel	50 Disk	Push Pedal	Jackshaft	Bevel-Pinion	Double-Chain	2	
Mitchell	Cone			Push Pedal	Rear Axle		Propeller-Shaft		2 in Prop. Shaft
Mitchell	Cone			Push Pedal	Rear Axle		Propeller-Shaft		2 in Prop. Shaft
Pullman					Rear Axle		Propeller-Shaft		
Frayer-Miller	Expanding					Spur-Pinion	Propeller-Shaft	3	
Compound							Optional		
Compound							Optional		
Compound							Optional		
Compound							Optional		
Mitchell	Cone			Push Pedal	Rear Axle		Propeller-Shaft		2 in Prop. Shaft
Pullman					Rear Axle		Propeller Shaft		
Pullman					Rear Axle		Propeller-Shaft		
Triumph	Multiple Disk	Met. to Met		Push Pedal			Propeller-Shaft		
National	Self-Centering-Cone	Leather to Castiron	In Oil	Push Pedal			Propeller-Shaft		
National	Self-Centering Cone	Leather to Castiron	In Oil	Push Pedal	Real Axle		Propeller-Shaft		
National	Self-Centering Cone	Leather to Castiron	In Oil	Push Pedal			Propeller-Shaft		
Detroit	Cone			Push Pedal	Rear Axle	Bevel-Pinion	Propeller-Shaft		2 in Prop. Shaft
Aerocar	Disk	Bronze to Steel	14 Disks	Push Pedal	Rear Axle		Propeller-Shaft		2 in Prop. Shaft
Craig-Toledo	Disk	Bronze to Steel	In Oil Mul'ple	Push Pedal			Propeller-Shaft		None
Rainier	Self-Centering Cone	Cork to Castiron			Rear Axle	Bevel-Pinion	Propeller-Shaft		In Prop. & Clu'ch
Cleveland	Self-Centering Cone	Cork Inserts		Push Pedal		Bevel-Pinion			In Prop. & Cl'ch
Compound							Optional		
Compound							Double-Chain		
Am. Mercedes	Constricting	Steel to Iron	In Oil		Jackshaft	Bevel-Pinion	Double-Chain	Op'nal	
B. L. M.	Self-Centering Cone	Cork Inserts		Push Pedal	Rear Axle	Bevel-Pinion	Propeller-Shaft	2.25	2 in Prop. Shaft
Moore	Cone	Steel to Iron	In Oil	Push Pedal	Rear Axle	Spur-Pinion	Propeller-Shaft		2 in Prop. Shaft
Lane					Rear Axle	Bevel-Pinion	Single-Chain		
Lane					Rear Axle	Bevel-Pinion	Single-Chain		
Glide	Disk	Multiple		Push Pedal	Rear Axle	Spur-Pinion	Propeller-Shaft		1 in Clutchshaft
Glide	Disk	Multiple			Rear Axle		Propeller-Shaft		
Glide	Disk		Multiple				Propeller-Shaft		
White							Propeller-Shaft		
Reo	Disk		Multiple	Pedal & Lev'r	Rear Axle	Bevel-Pinion	Propeller-Shaft		2 in Prop. Shaft
Reo	Disk	Multiple	In Oil	Pedal & Lev'r	Rear Axle	Bevel-Pinion	Single-Chain		
Zust	Disk	Bronze to Steel	50 Disks	Push Pedal	Jackshaft	Bevel-Pinion	Single-Chain		
Stod'd-D'ton	Cone	Leather to Castiron		Push Pedal	Jackshaft	Bevel-Pinion	Double-Chain		2 Double
Stod'd-D'ton	Cone	Leather to Castiron		Push Pedal	Rear Axle	Bevel-Pinion	Propeller-Shaft		2 Double
Lansden					Rear Axle	Bevel-Pinion	Propeller-Shaft	3.1	2 in Prop. Shaft
Johnson	Jaw				Jackshaft	Spur-Pinion	Double-Chain		
Martine	Expanding	Steel to Iron			Rear Axle	Spur-Pinion	Propeller-Shaft		
Am. Truck	Disk	Bronze to Steel	22 Disks	Push Pedal	Jackshaft	Bevel-Pinion	Double-Chain		
Moon	Disk	Bronze to Steel	57 Disks	Lever	Jackshaft	Spur-Pinion	Double-Chain		
C. G. & V	Cone	Leather to Castiron		Push Pedal	Rear Axle	Spur-Pinion	Propeller-Shaft		Clutch
Mercedes	Spiral Spring	Steel to Iron	In Oil	Push Pedal	Jackshaft	Spur-Pinion	Double-Chain		2 in Prop. Shaft
English Daimler	Cone	Leather to Castiron		Push Pedal	Jackshaft	Bevel-Pinion	Double-Chain		
English Daimler	Cone	Leather to Castiron		Press Pedal	Jackshaft		Double-Chain		
English Daimler	Cone	Leather to Castiron		Press Pedal	Jackshaft	Bevel-Pinion	Double-Chain		1 in Clutchshaft
Delahaye	Cone	Leather to Castiron		Press Pedal	Jackshaft	Bevel-Pinion	Double-Chain		1 in Clutchshaft
Marion	Disk	Steel to Steel		Push Pedal	Jackshaft	Bevel-Pinion	Double-Chain		2 in Shaft
Austin	Disk	Leather		Push Pedal	Rear Axle	Spur-Pinion	Propeller-Shaft		1 in Clutchshaft
Carter-Car				Push Pedal	Rear Axle				
Moline	Cone	Leather		Push Pedal	Rear Axle	Bevel-Pinion	Propeller-Shaft		
Wood	Cone	Leather		Push Pedal	Jackshaft		Double-Chain		
Pungs-Finch	Multiple Disk		In Oil	Push Pedal					
Pierce-Racine	Cone	Leather		Push Pedal	Rear Axle	Bevel-Pinion	Propeller-Shaft		2 in Prop. Shaft
Rambler	Disk			Lever	Rear Axle		Single-Chain		
Crawford	Disk	Bronze Steel		Push Pedal	Jackshaft		Double-Chain		
Berliet	Cone	Leather	In Gearcase	Push Pedal	Jackshaft	Spur-Pinion	Double-Chain		
Frontenac									
Rambler	Cone			Push Pedal	Jackshaft		Double-Chain		
Deere	Multiple Disk		In Oil	Push Pedal	Rear Axle		Propeller-Shaft		
Itala	Disk		Multiple	Push Pedal	Rear Axle		Propeller-Shaft		2 in Prop. Shaft
Simplicity	Rolling	Friction Board		Lever	None	None	Double-Chain		None

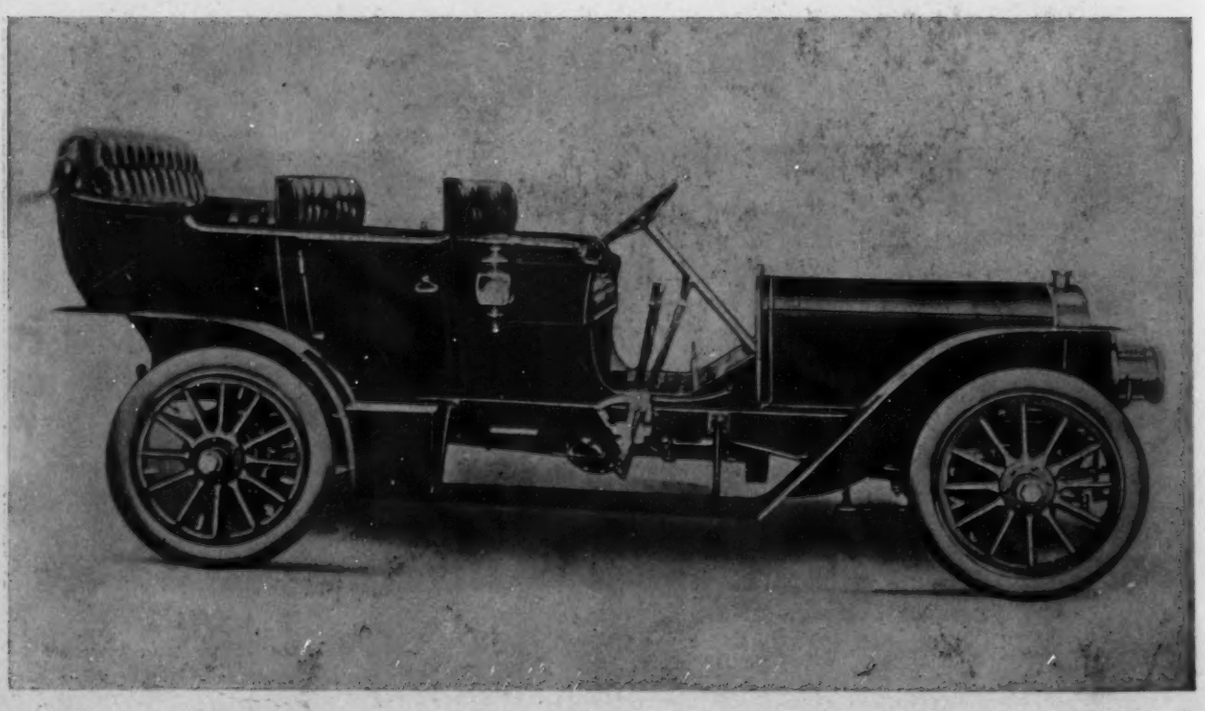
MORA TOURER, 24-H.P., 4 CYLINDERS, PRICE $2,200; MORA MOTOR CAR CO., ROCHESTER, N. Y.



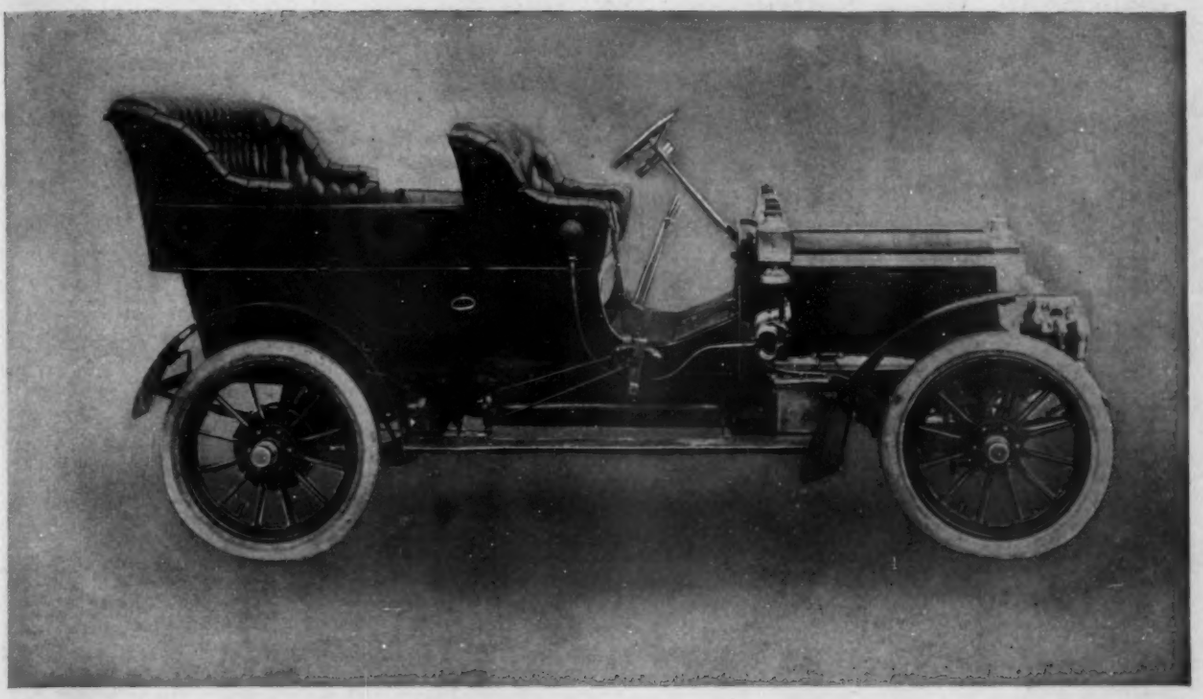
FORD MODEL K, 40-H.P., 6 CYLINDERS, PRICE $2,800; FORD MOTOR CO., DETROIT, MICH.



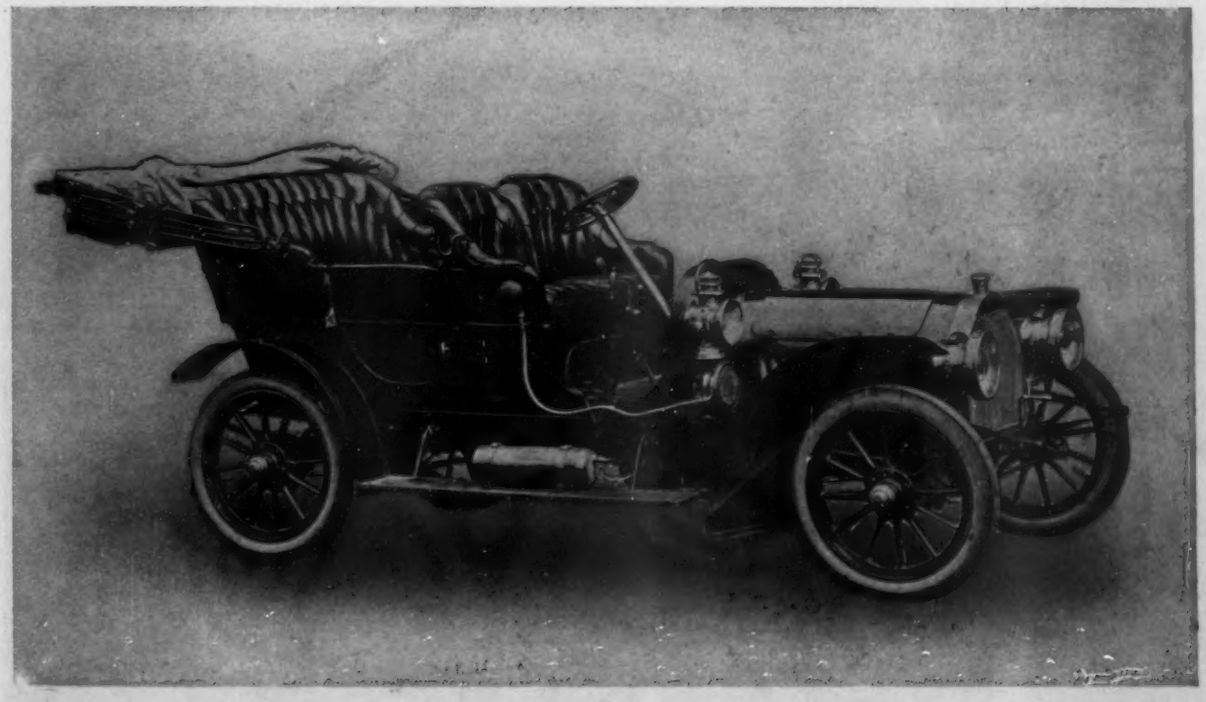
AEROCAR, 40-H.P., 4 CYLINDERS, PRICE $2,750; AEROCAR CO., DETROIT, MICH.



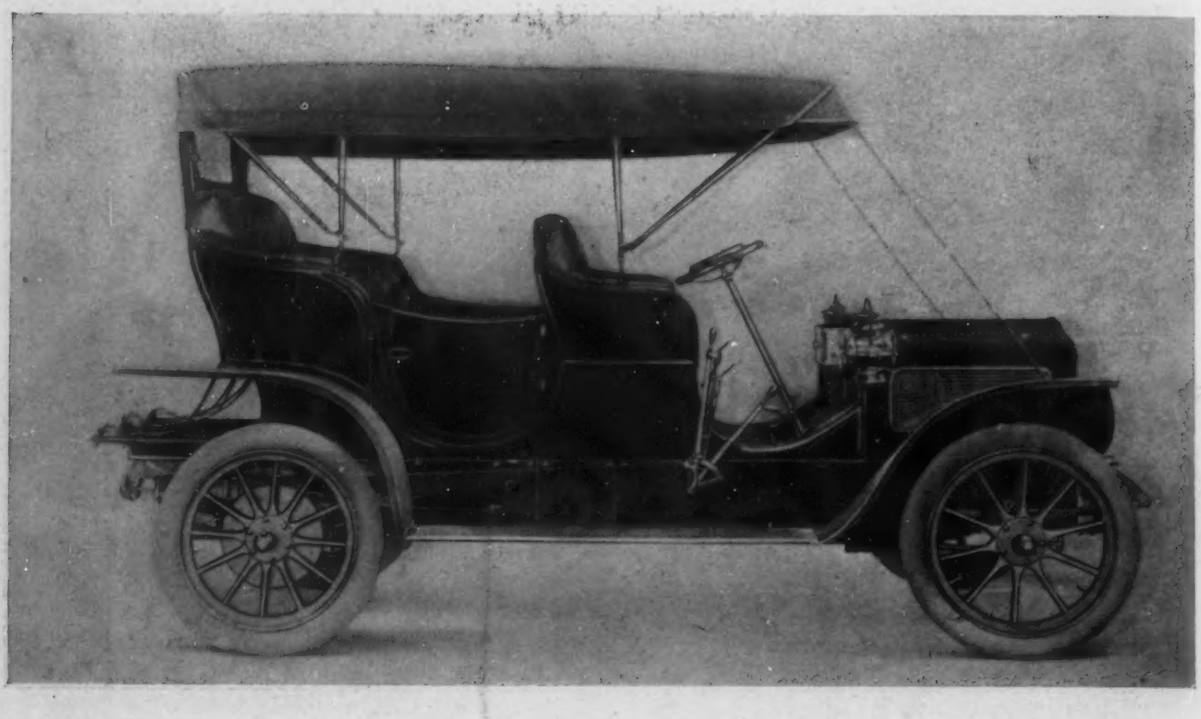
COMPOUND, 40-H.P., 6 CYLINDERS, PRICE $3,750; E. H. V. CO., MIDDLETOWN, CONN.



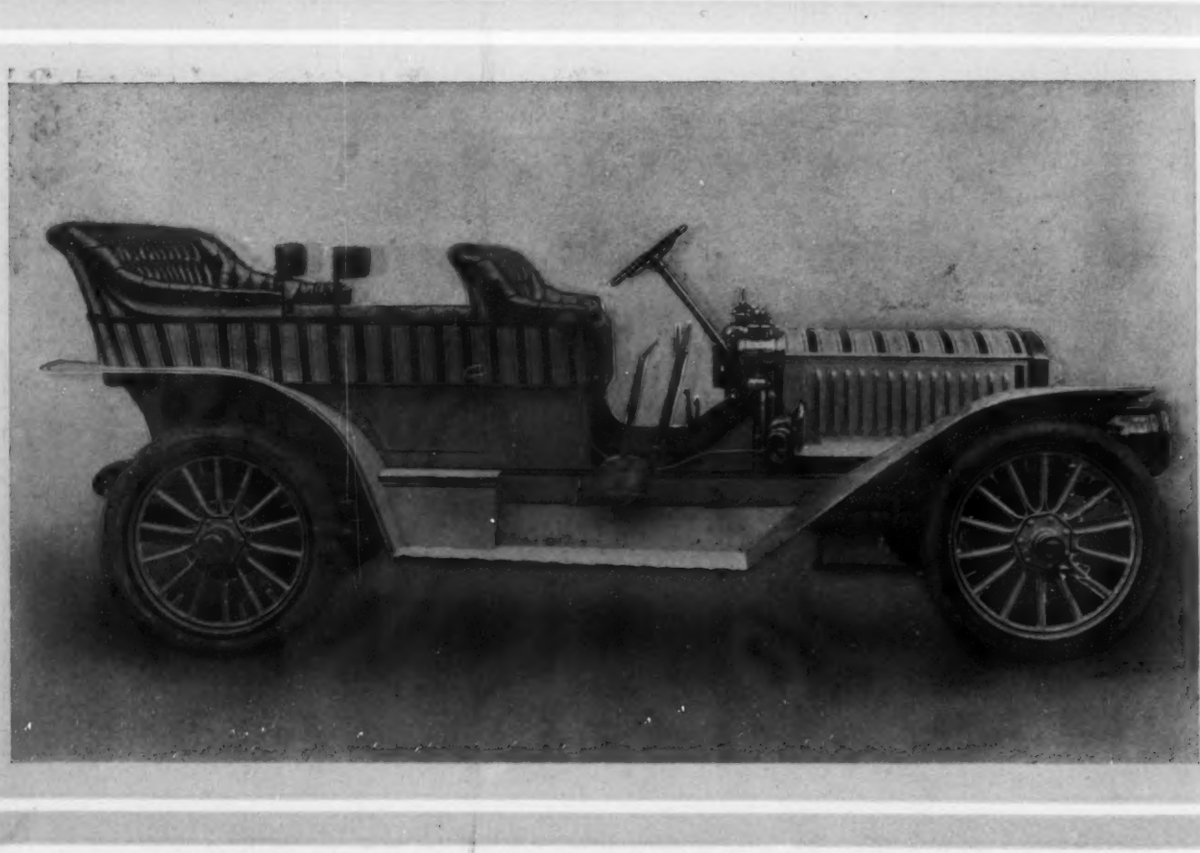
DORRIS MODEL B, 30-H.P., 4 CYLINDERS, PRICE $2,500; DORRIS MOTOR CAR CO., ST. LOUIS, MO.



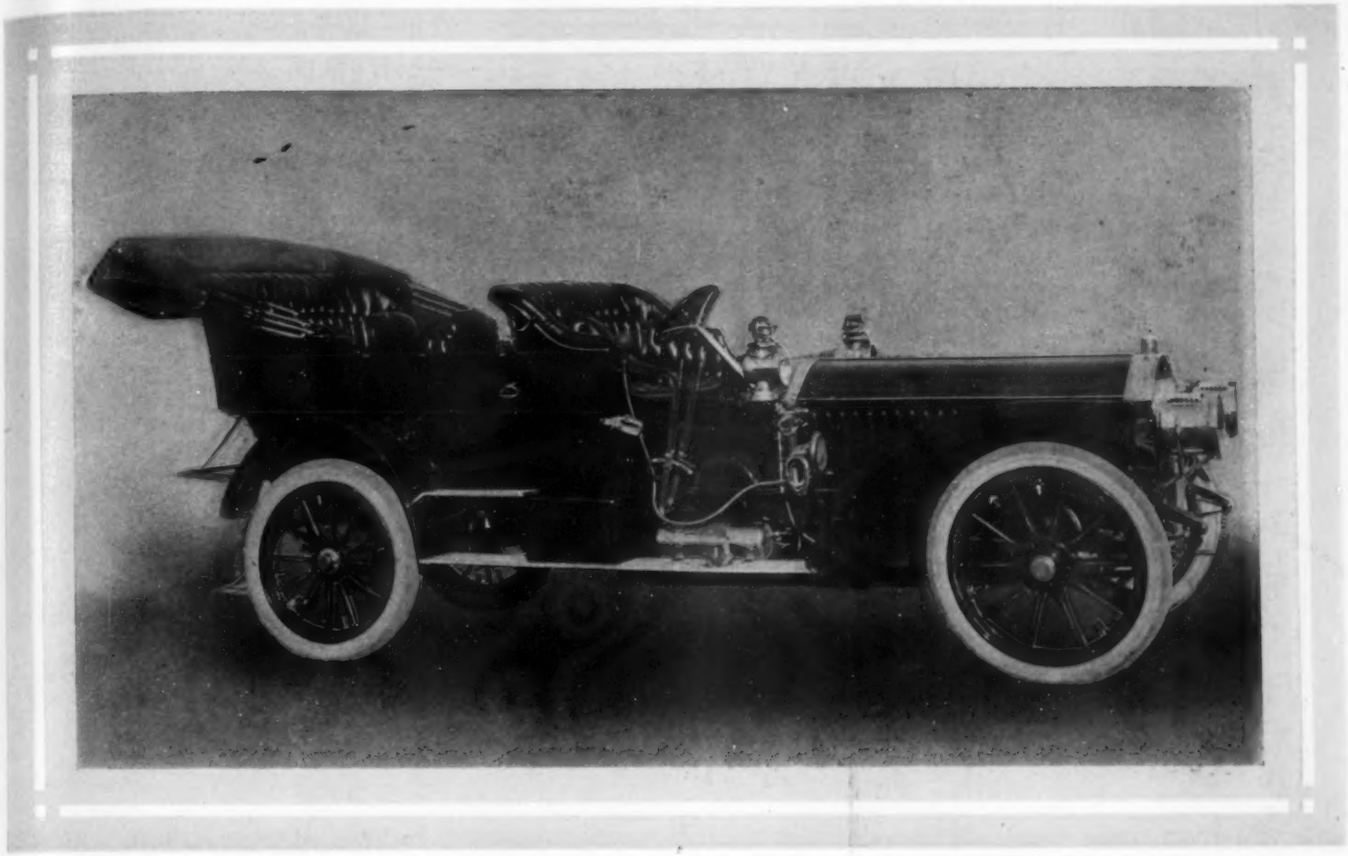
PREMIER, 24-28-H.P., 4 CYLINDERS, PRICE $2,250; PREMIER MOTOR CAR CO., INDIANAPOLIS, IND.



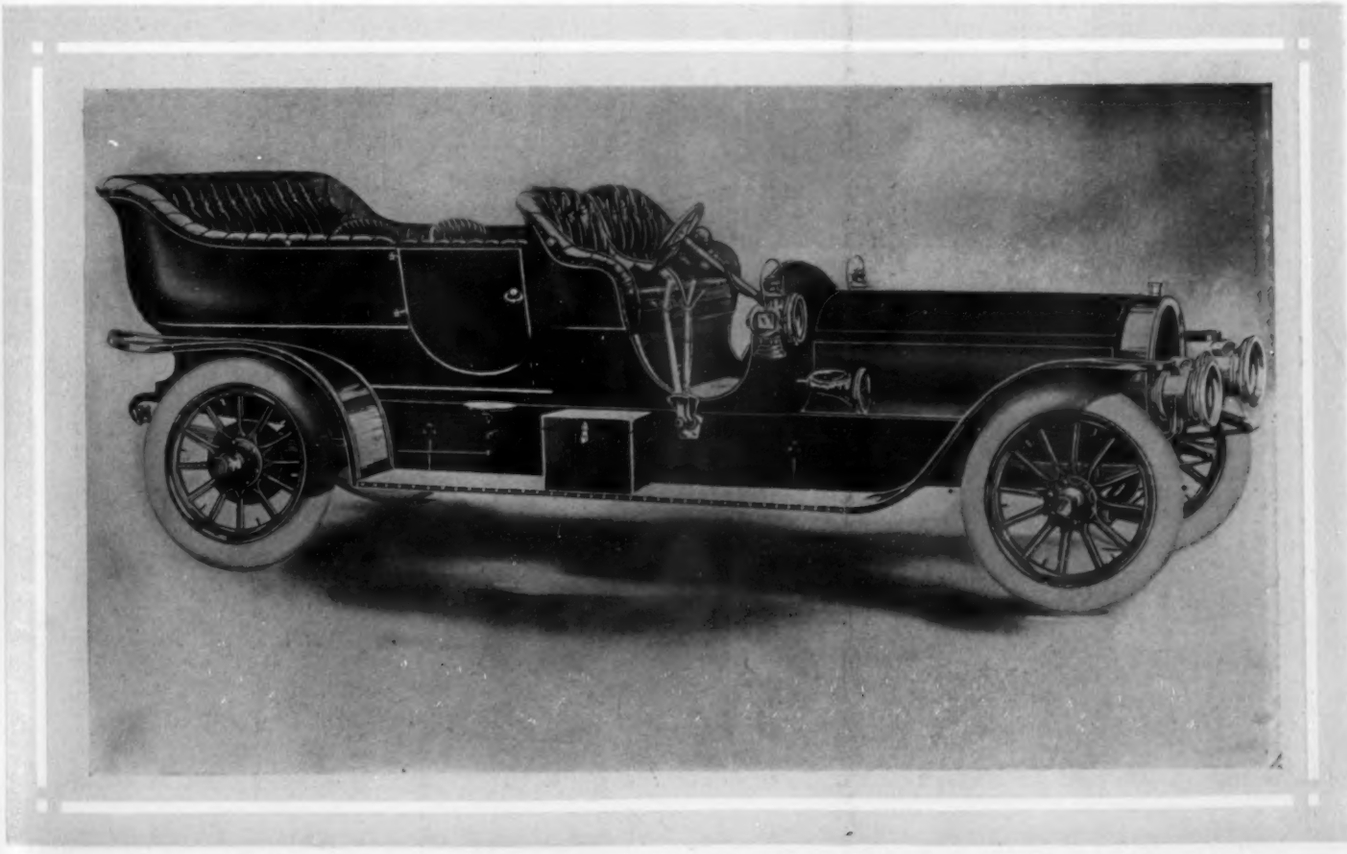
WHITE STEAMER MODEL G, 30-H.P., 2 CYLINDERS, PRICE $3,700; THE WHITE CO., CLEVELAND, O.



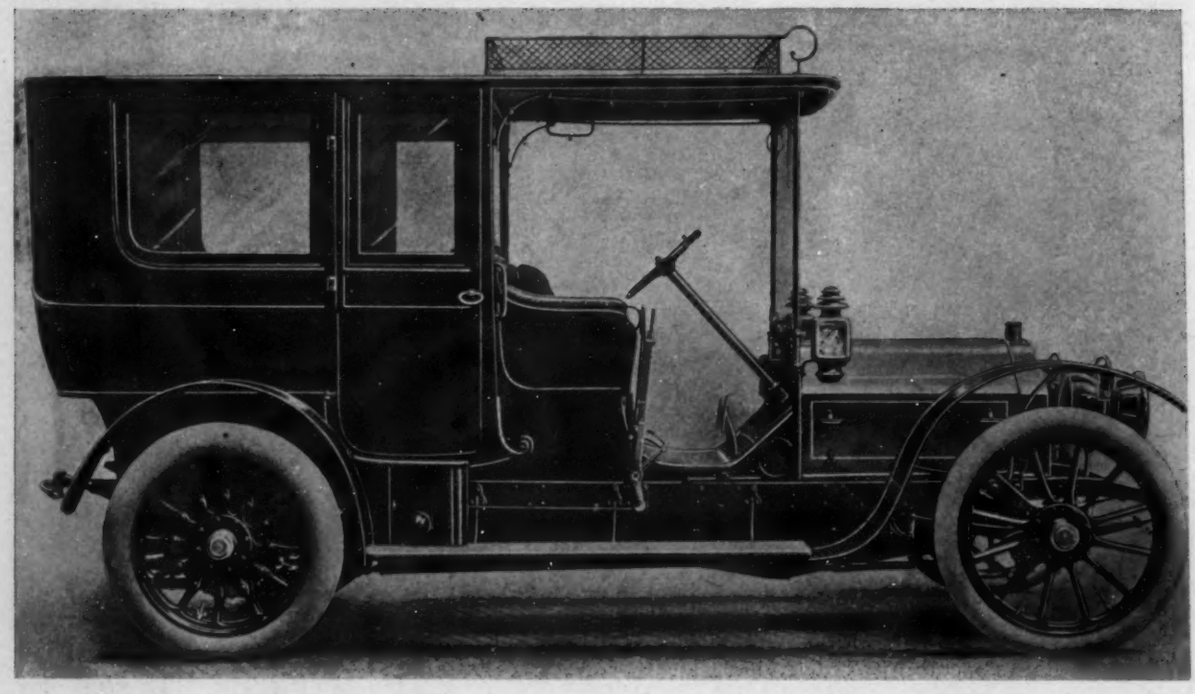
FRAYER-MILLER, 50-H.P., 4 CYLINDERS, PRICE $4,000; OSCAR LEAR AUTOMOBILE CO., COLUMBUS, O.



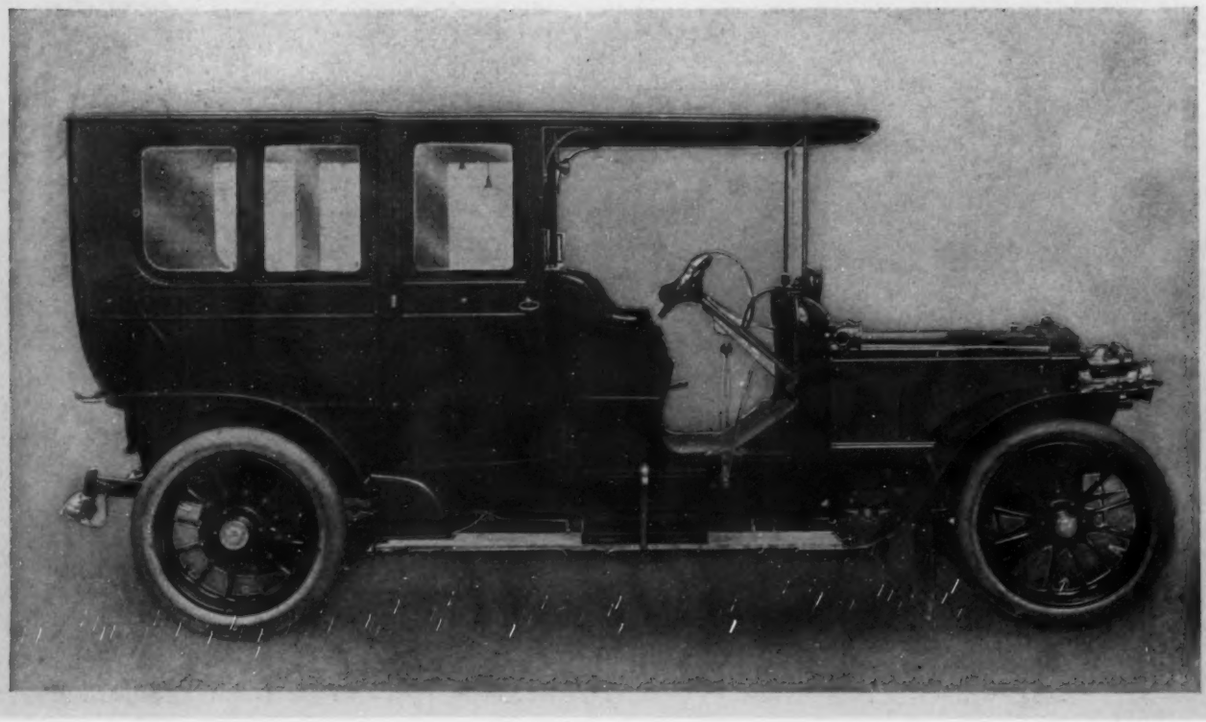
AMERICAN NAPIER, 60-H.P., 6 CYLINDERS, PRICE $8,000; NAPIER MOTOR CO. OF AMERICA, BOSTON, MASS.



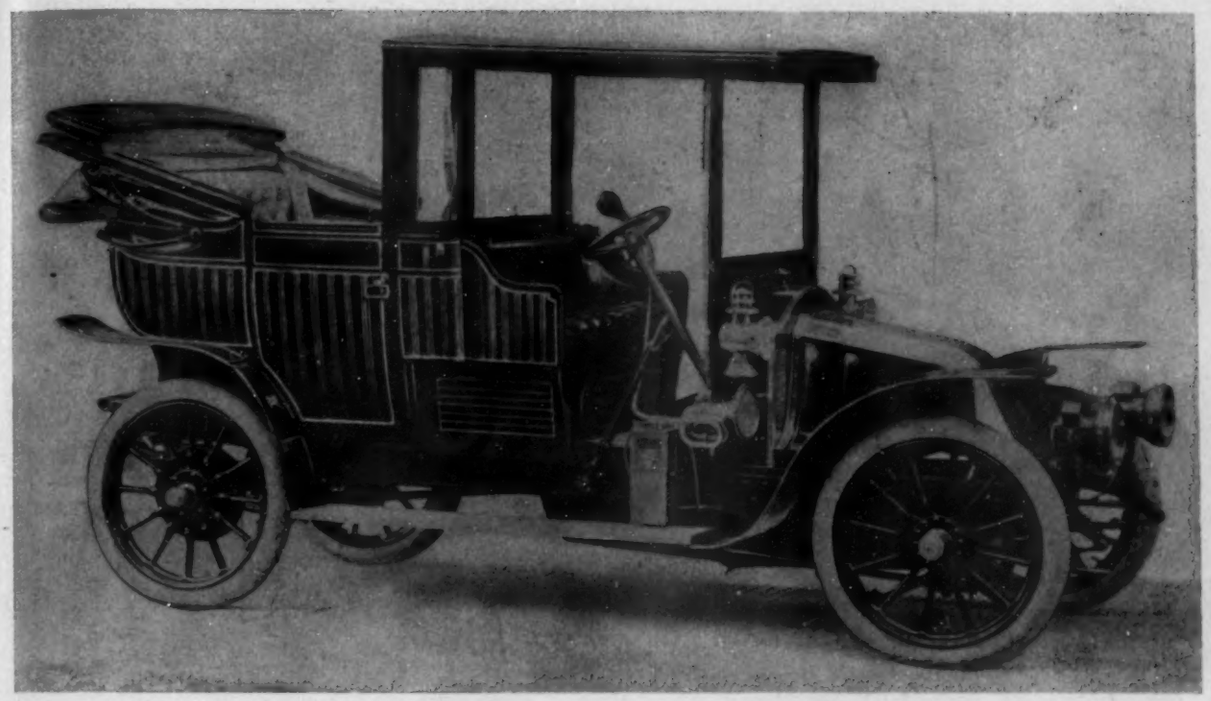
NATIONAL MODEL L, 75-H.P., 6 CYLINDERS, PRICE $5,000; NATIONAL MOTOR VEHICLE CO., INDIANAPOLIS, IND.



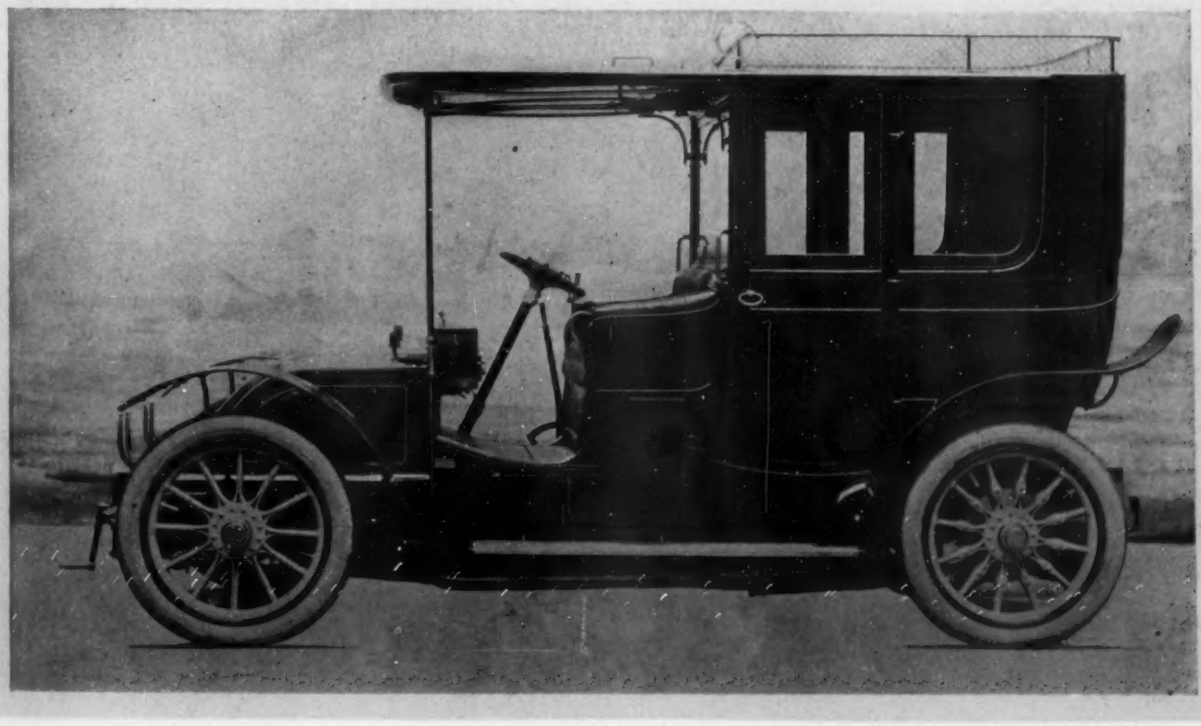
WESTINGHOUSE, 40-H.P., 4 CYLINDERS, PRICE (CHASSIS) $7,500; SOCIETE ANONYME WESTINGHOUSE, NEW YORK CITY.



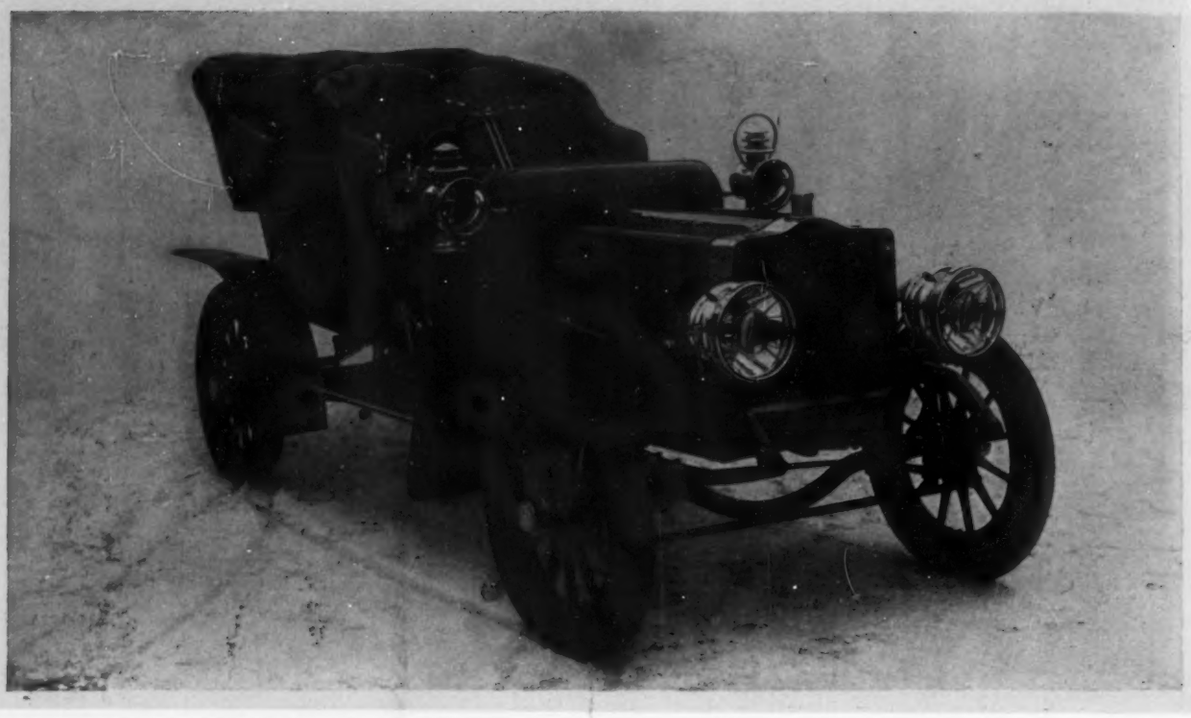
ENGLISH DAIMLER, 30-40-H.P., 4 CYLINDERS; PRICE $7,500; WYCKOFF, CHURCH & PARTRIDGE, NEW YORK CITY.



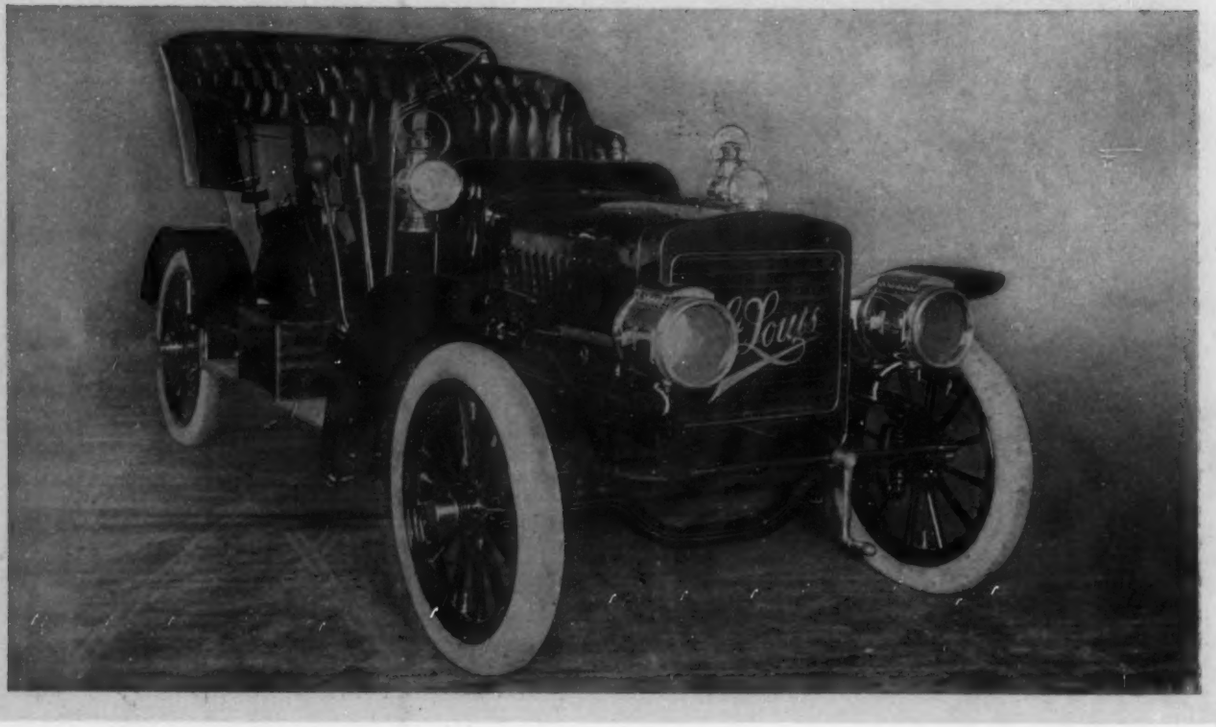
RENAULT, 35-45-H.P., 4 CYLINDERS, PRICE (CHASSIS) $8,250; RENAULT FRERES SELLING BRANCH, NEW YORK CITY.



C. G. V., 30-H.P., 4 CYLINDERS, PRICE (CHASSIS) $7,000; C. G. V. IMPORT CO., NEW YORK CITY.

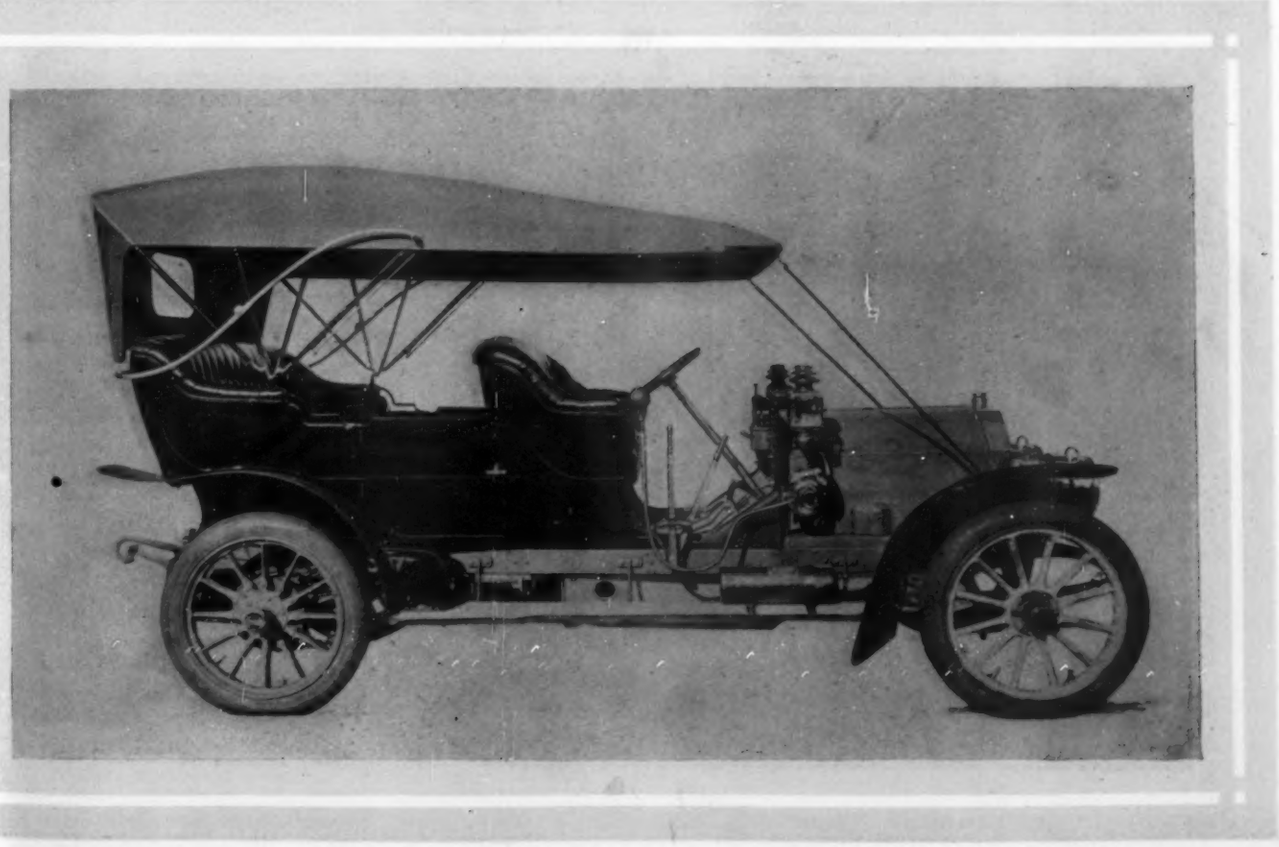


MITCHELL MODEL D, 30-H.P., 4 CYLINDERS, PRICE $1,800; MITCHELL MOTOR CAR CO., RACINE, WIS.



ST. LOUIS, 30-35-H.P., 4 CYLINDERS, PRICE $2,500; ST. LOUIS MOTOR CAR CO., PEORIA, ILL.

HARRISON CRANKLESS, 40-H.P., 4 CYLINDERS, PRICE $5,000; HARRISON WAGON CO., GRAND RAPIDS, MICH.



BERLIET, 22-H.P., 4 CYLINDERS, PRICE $5,500; AMERICAN LOCOMOTIVE AUTOMOBILE CO., NEW YORK CITY.

CARTERCAR, 20-H.P., 2 CYLINDERS, PRICE $1,350; THE MOTOR CAR CO., DETROIT, MICH.

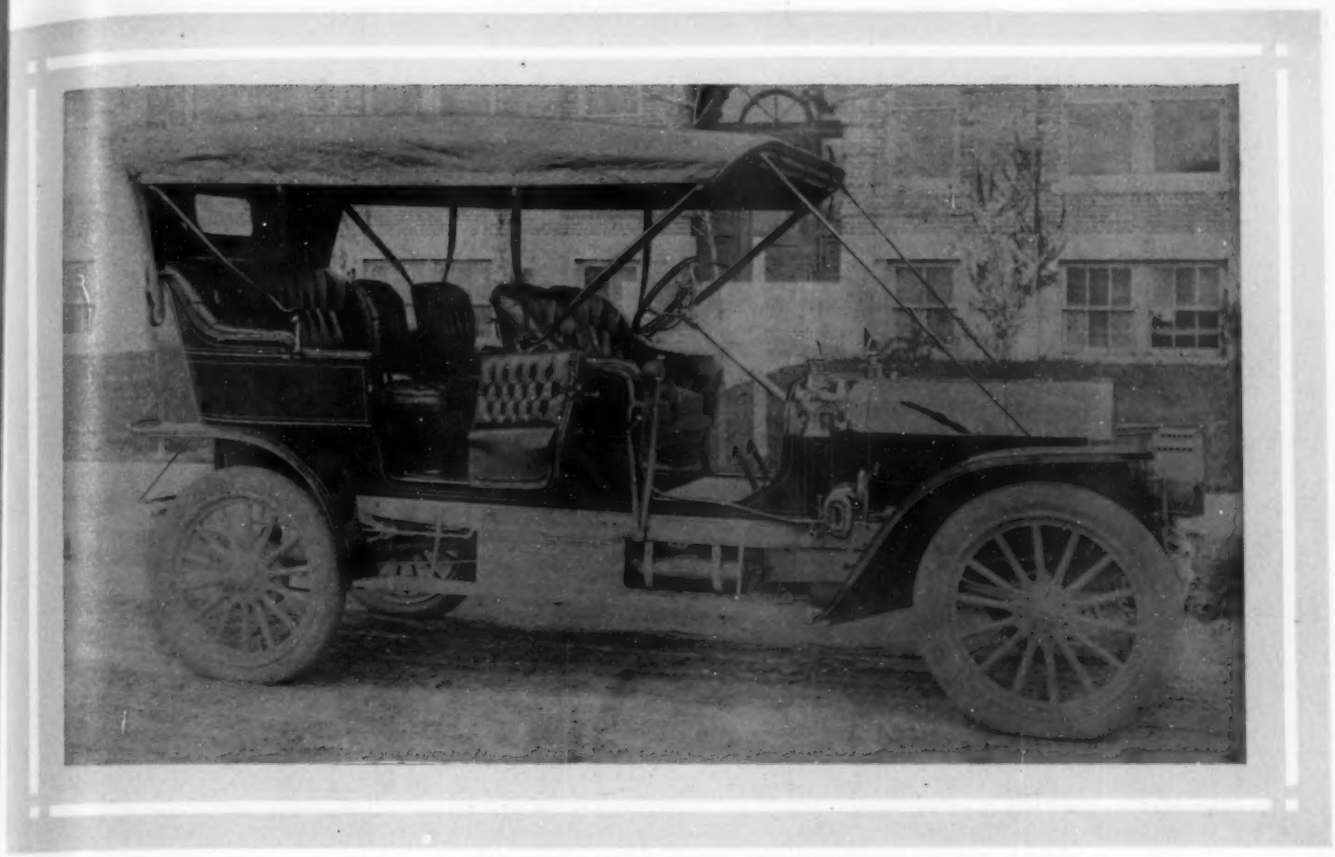
BRASIER LIMOUSINE, 50-60-H.P., 4 CYLINDERS, PRICE $12,000; E. B. GALLAHER, NEW YORK CITY.

AMERICAN MERCEDES, 45-H.P., 4 CYLINDERS, PRICE $7,500; DAIMLER MFG. CO., LONG ISLAND CITY.

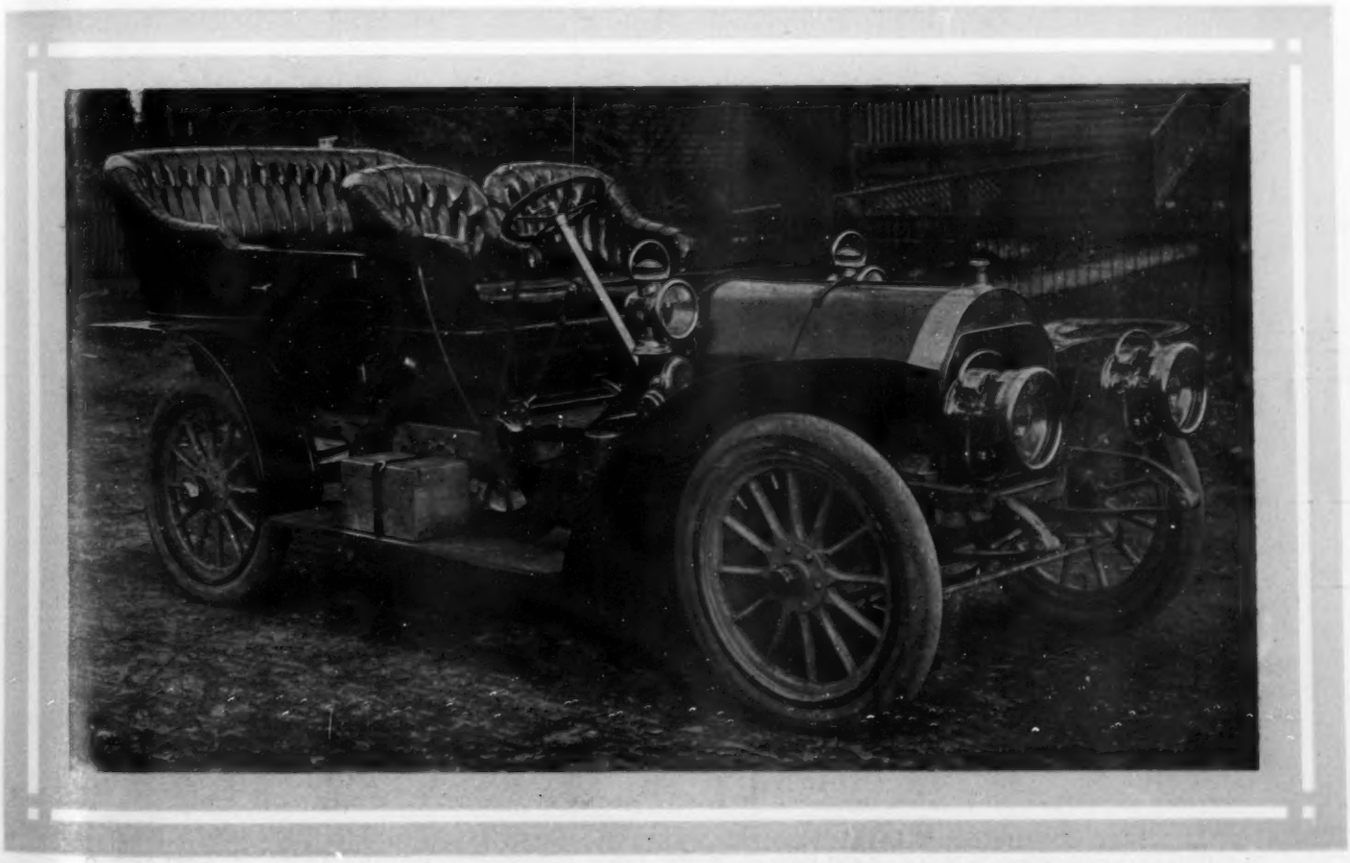
DRAGON, 24-26-H.P., 4 CYLINDERS, PRICE $2,000; DRAGON AUTOMOBILE CO., DETROIT, MICH.

PULLMAN, 40-H.P., 4 CYLINDERS, PRICE $3,000; YORK MOTOR CAR CO., YORK, PA.

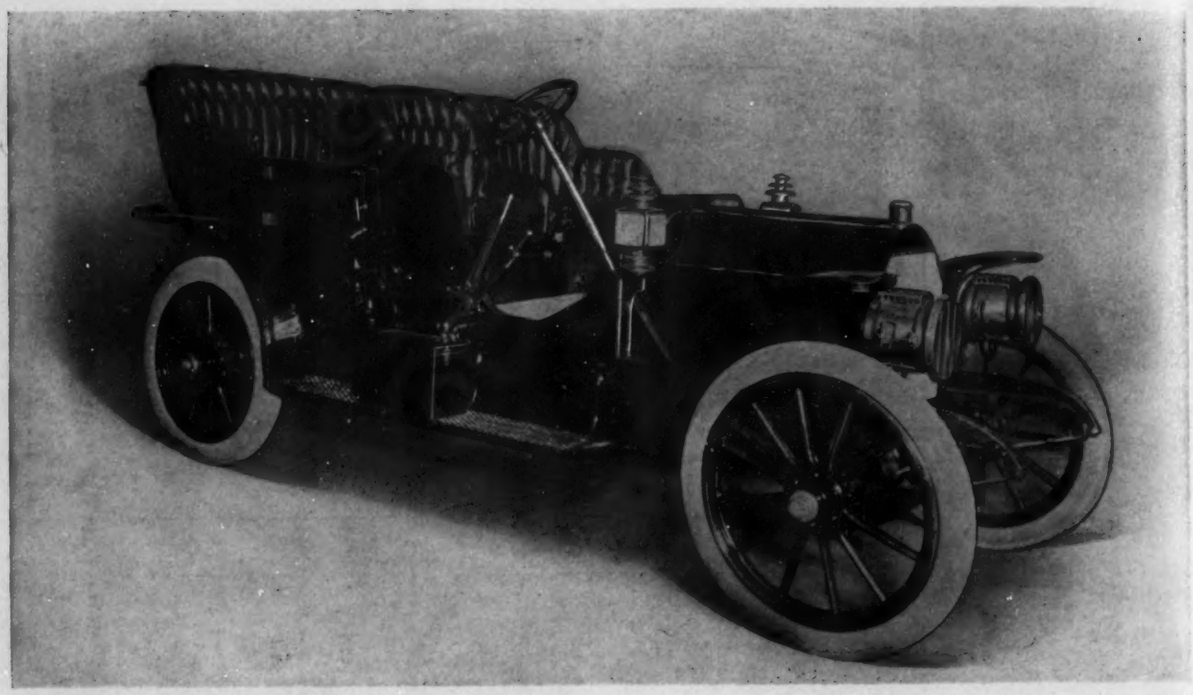
JACKSON MODEL C, 20-24-H.P., 2 CYLINDERS, PRICE $1,500; JACKSON AUTOMOBILE CO., JACKSON, MICH.



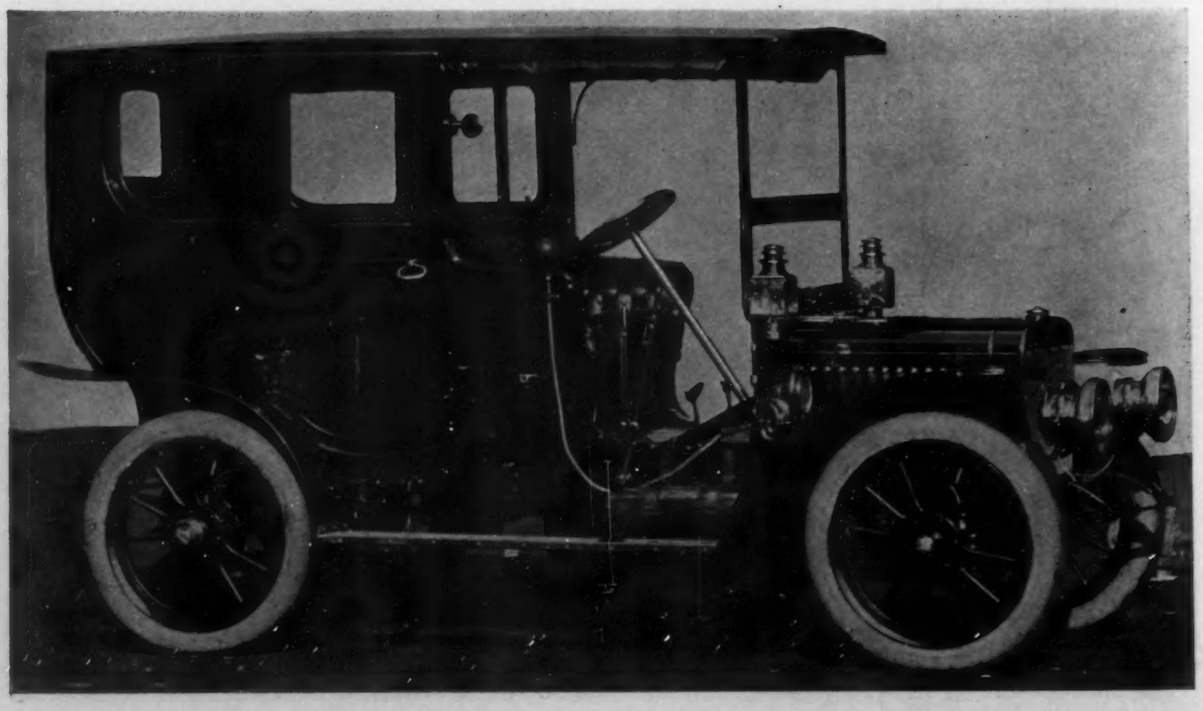
WELCH MODEL G, 50-H.P., 4 CYLINDERS, PRICE $4,200; WELCH MOTOR CAR CO., DETROIT, MICH.



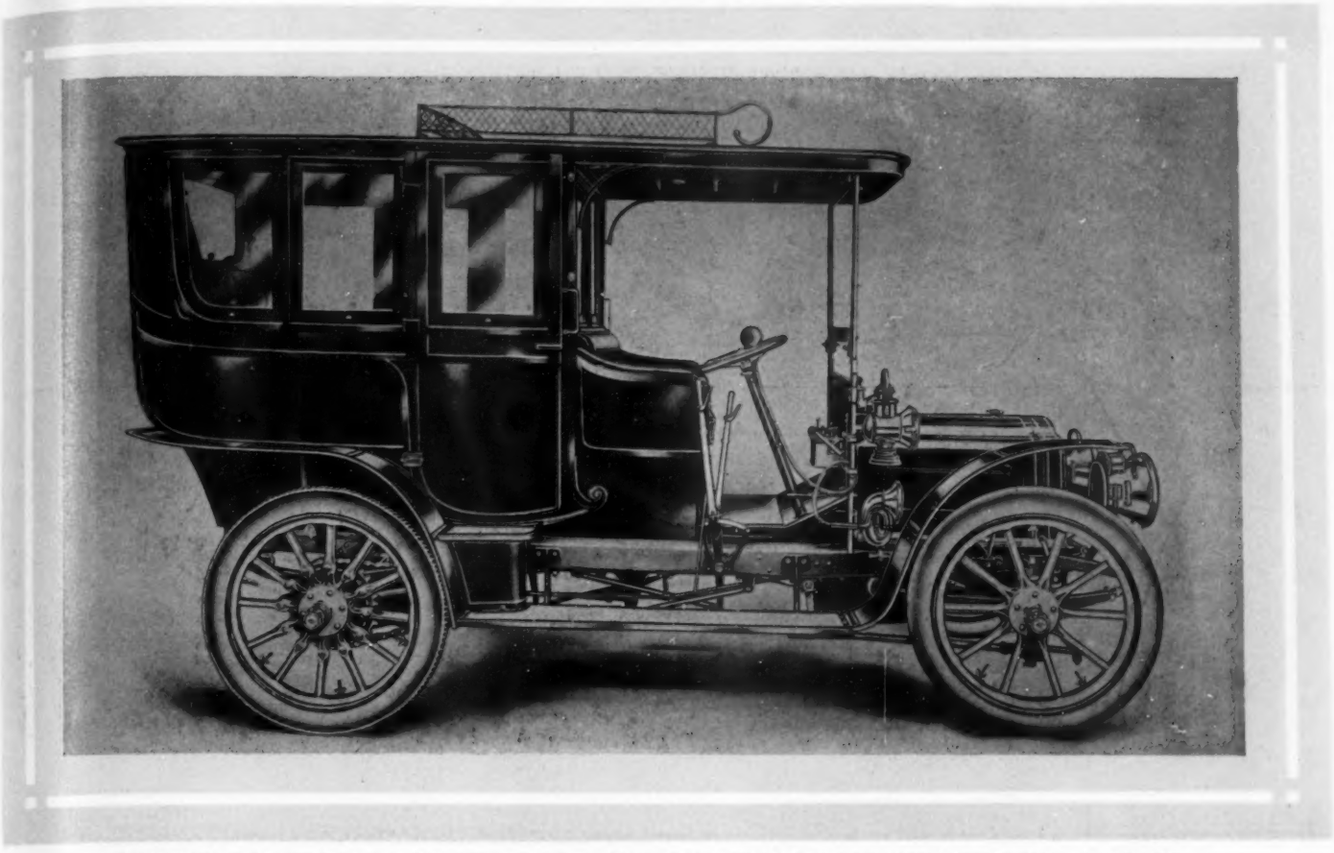
PENN, 35-H.P., 4 CYLINDERS, $2,800; PENNSYLVANIA AUTO MOTOR CO., PHILADELPHIA, PA.



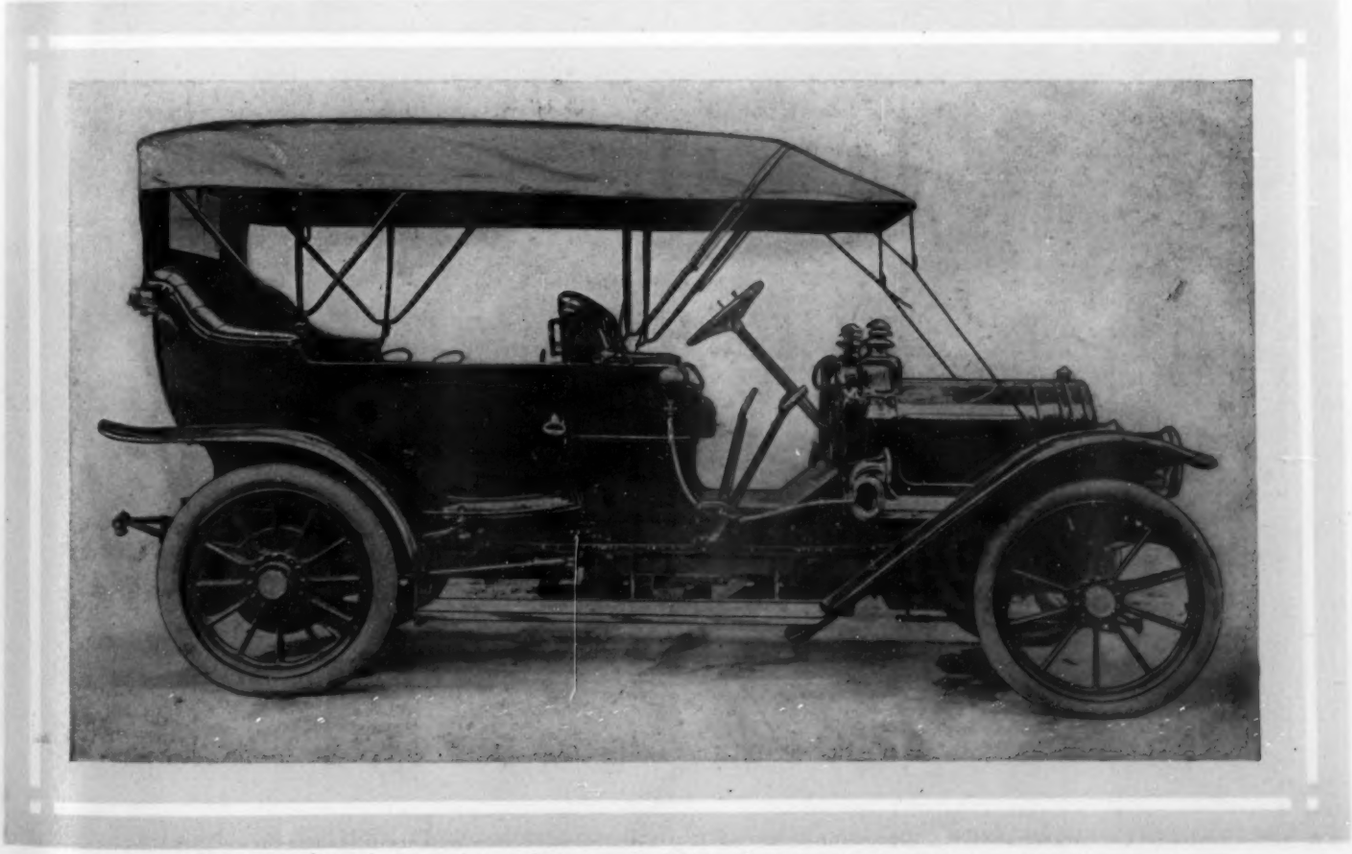
MOON, 30-35-H.P., 4 CYLINDERS, PRICE $3,000; MOON MOTOR CAR CO, ST. LOUIS, MO.



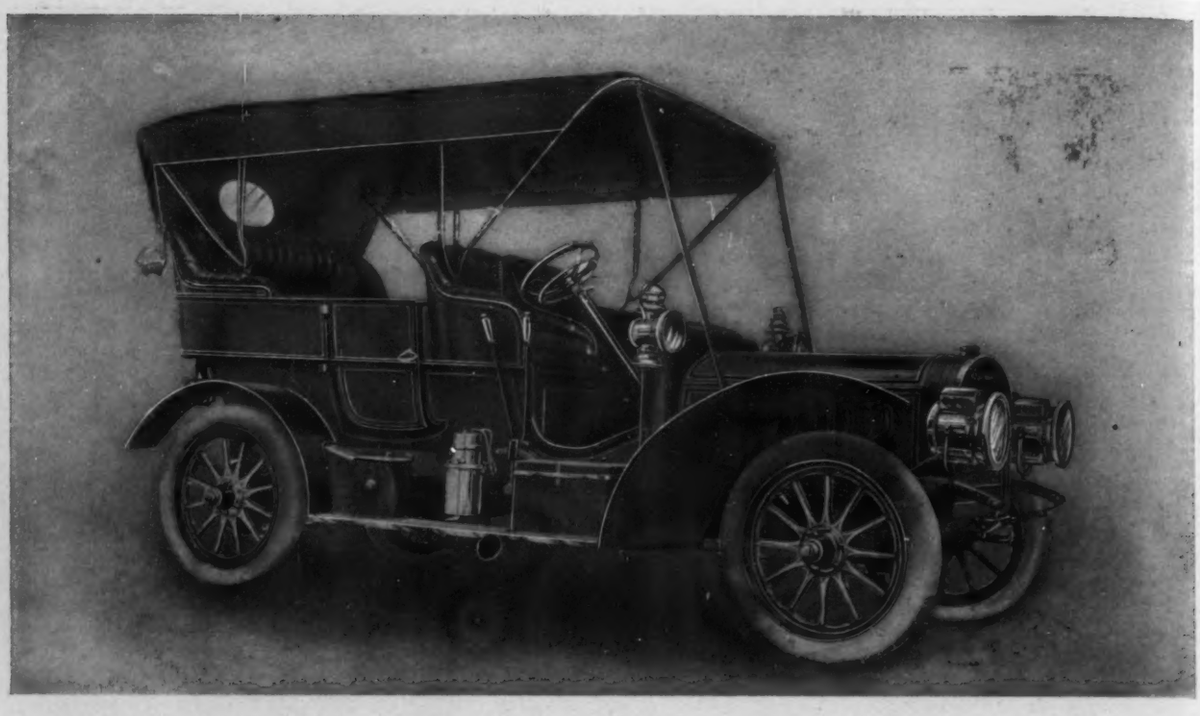
CLEVELAND LIMOUSINE, 30-35-H.P., 4 CYLINDERS, PRICE $4,000; CLEVELAND MOTOR CAR CO., CLEVELAND, O.



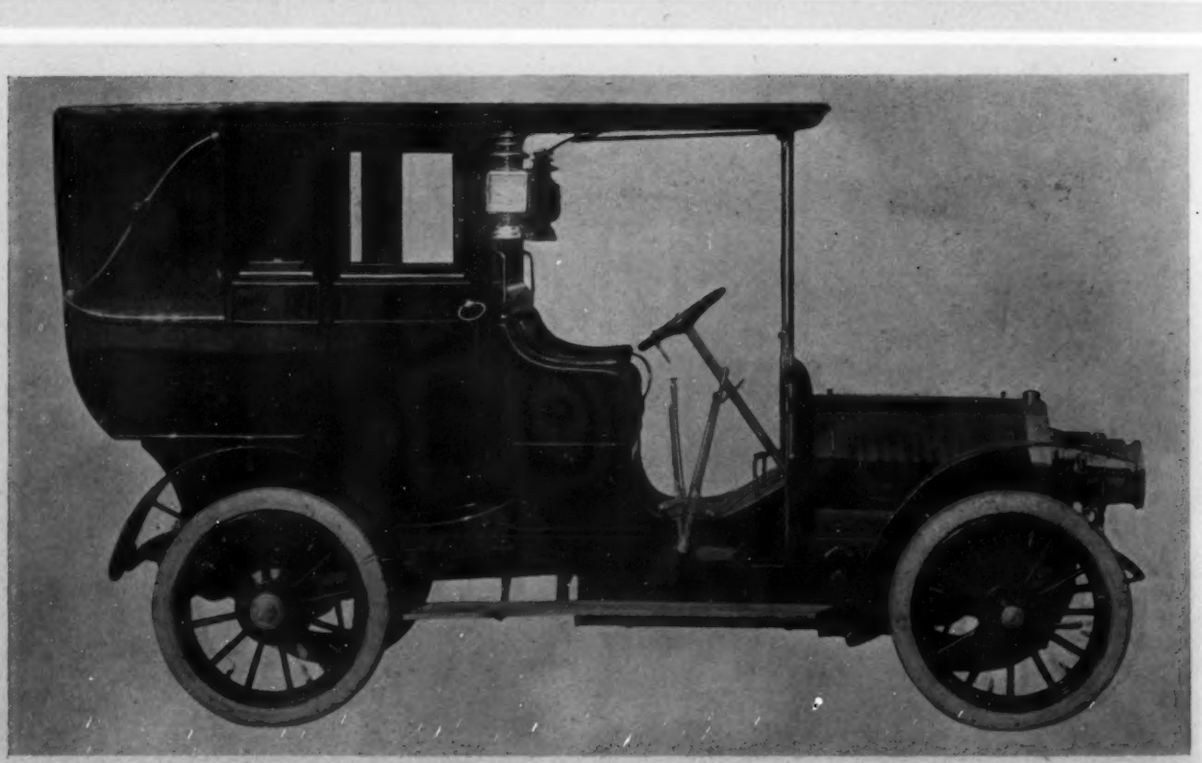
AMERICAN MORS, 50-H.P., 4 CYLINDERS, PRICE (CHASSIS) $6,000; ST. LOUIS CAR CO., ST. LOUIS, MO.



DE LUXE, 50-60-H.P., 4 CYLINDERS, PRICE $4,750; DE LUXE MOTOR CAR CO., DETROIT, MICH.

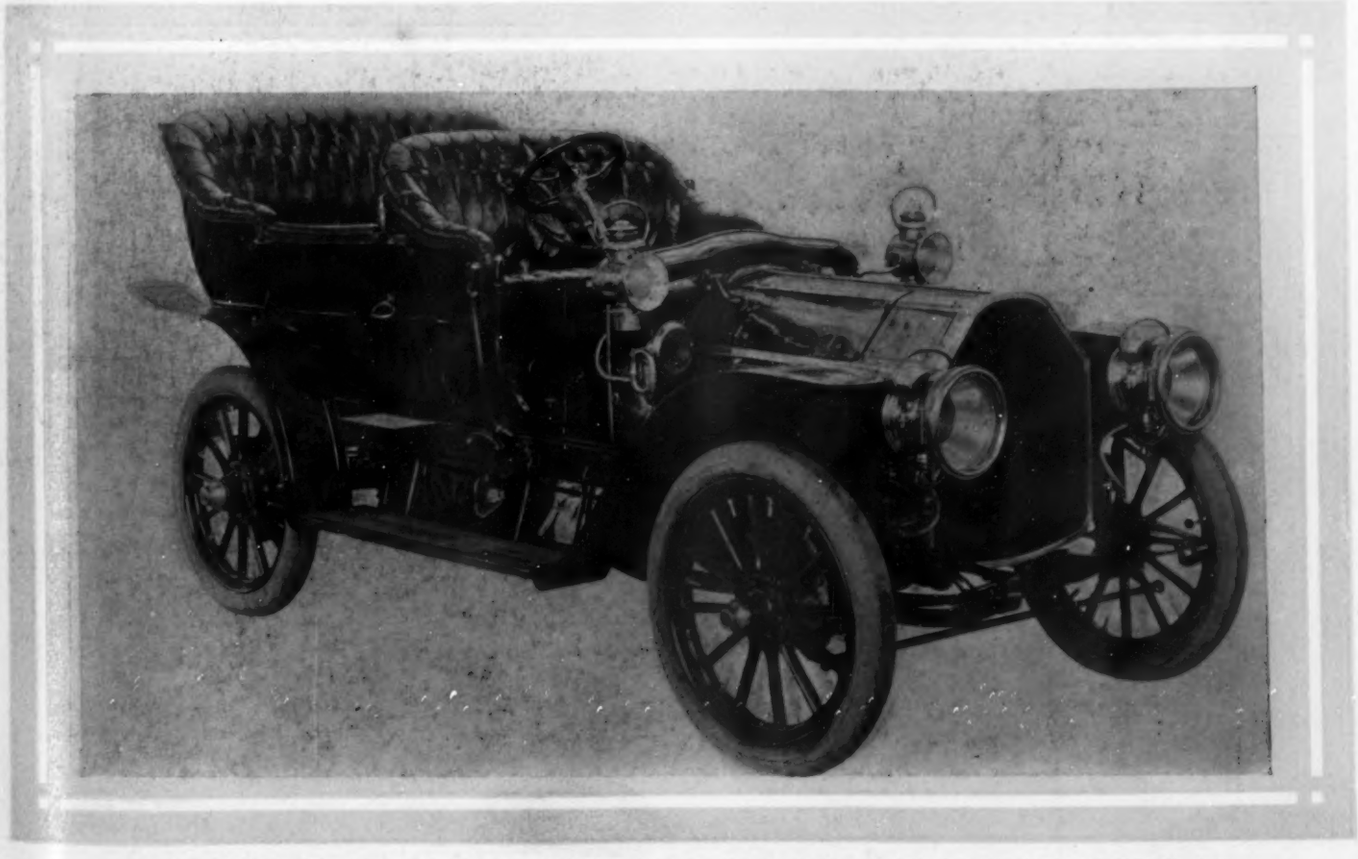


RAMBLER MODEL 25, 35-40-H.P., 4 CYLINDERS, PRICE $2,500; THOS. B. JEFFERY & CO., KENOSHA, WIS.

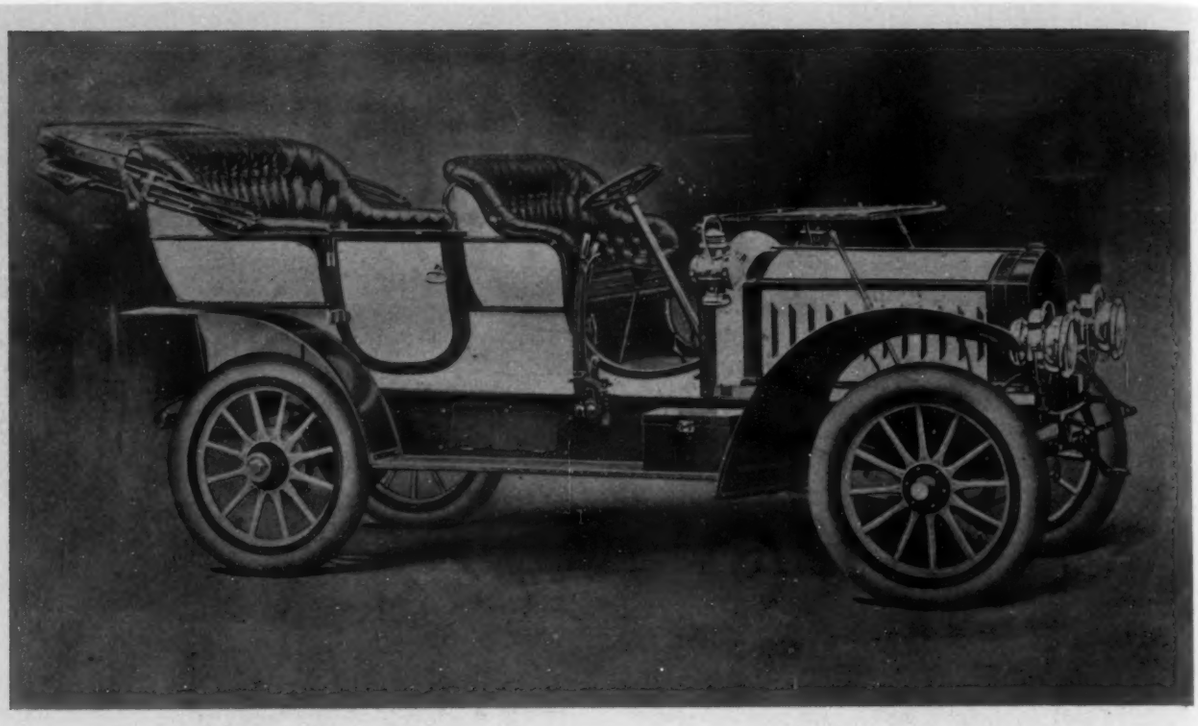


RAINIER, 30-35-H.P., 4 CYLINDERS, PRICE $4,250; THE RAINIER CO., NEW YORK CITY.

MAXWELL, 36-40-H.P., 4 CYLINDERS, PRICE $3,000; MAXWELL-BRISCOE MOTOR CO., TARRYTOWN, N. Y.

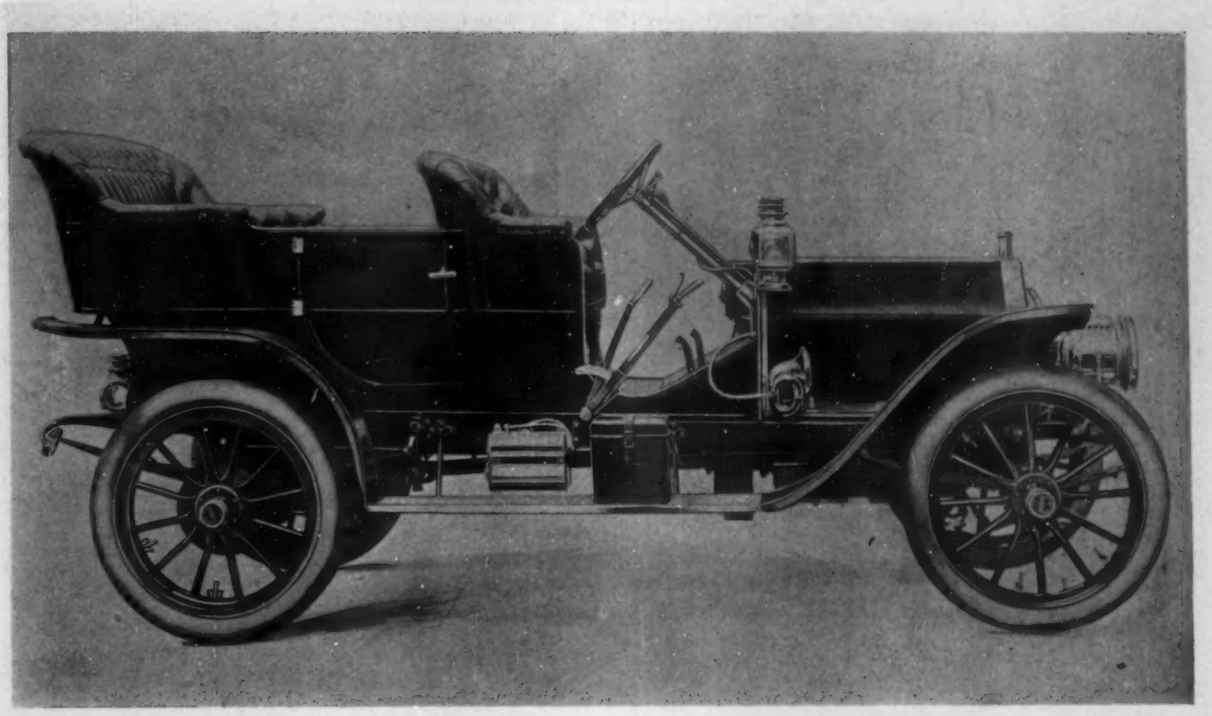


MARMON MODEL F, 30-35-H.P., 4 CYLINDERS, PRICE $3,500; NORDYKE & MARMON CO., INDIANAPOLIS, IND.

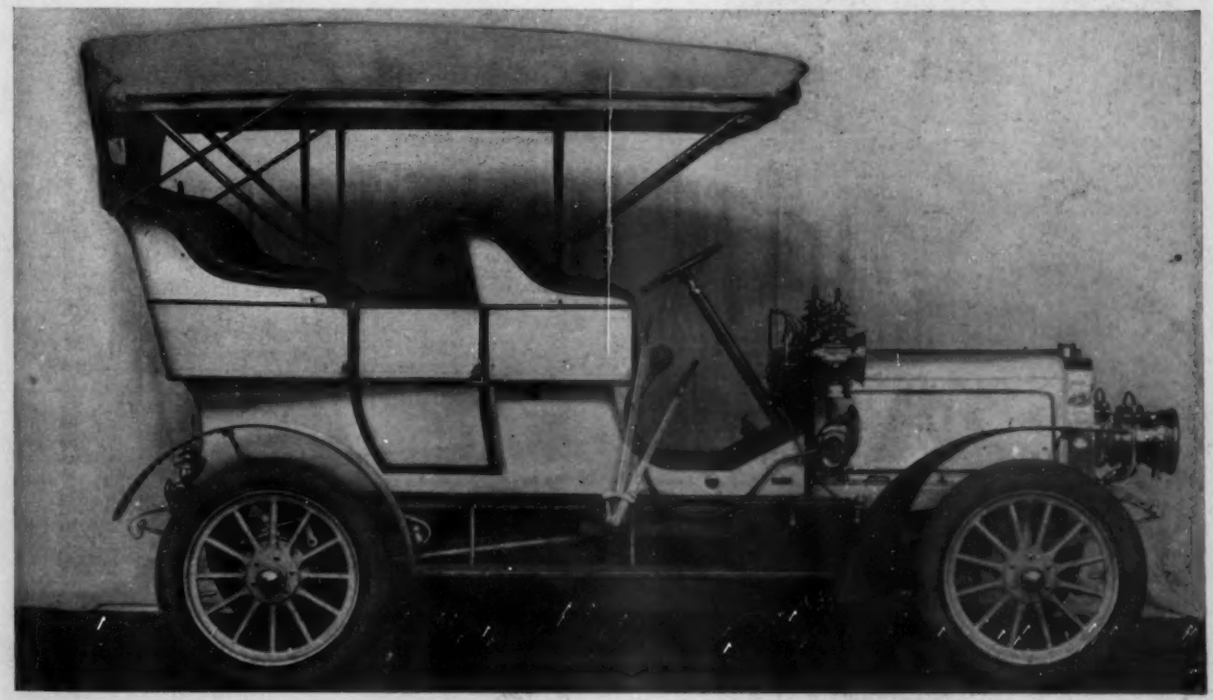


AUSTIN, 60-H.P., 4 CYLINDERS, PRICE $4,500; AUSTIN AUTOMOBILE CO., GRAND RAPIDS, MICH.

ACME, 50-H.P., 4 CYLINDERS, PRICE $4,000; ACME MOTOR CAR CO., READING, PA.

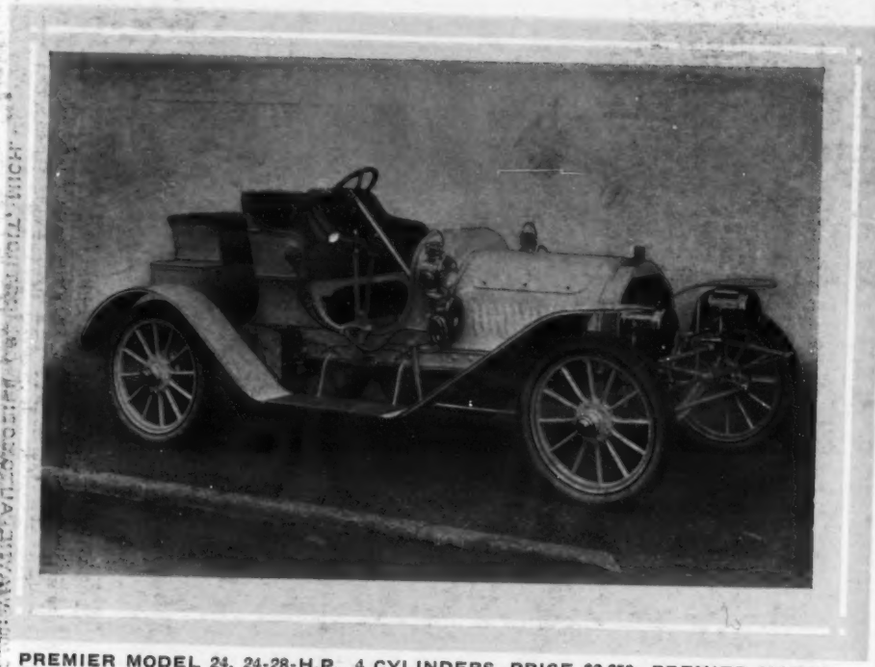


WAYNE MODEL N, 30-35-H.P., 4 CYLINDERS, PRICE $2,500; WAYNE AUTOMOBILE CO., DETROIT, MICH.

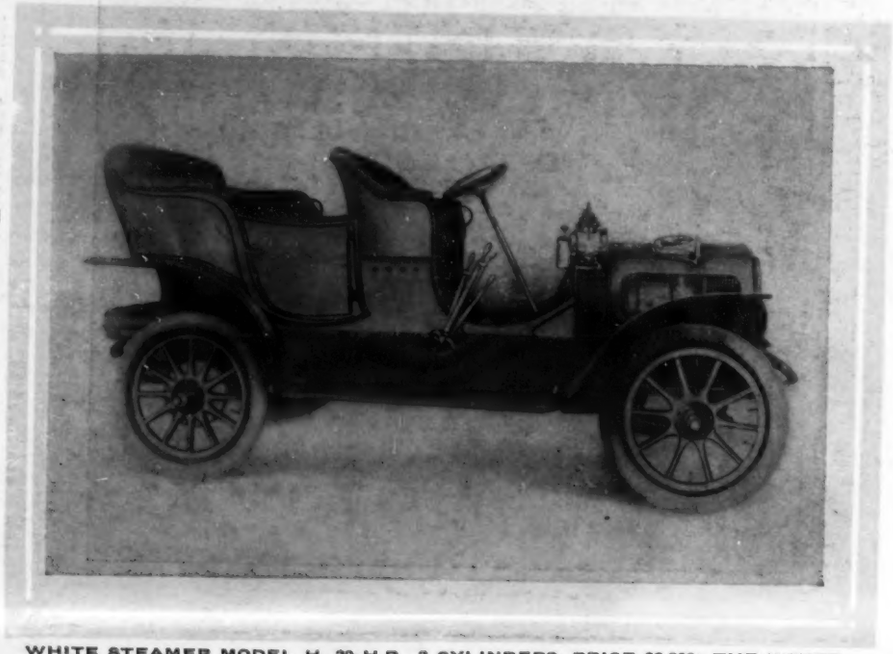


DEERE, 25-30-H.P., 4 CYLINDERS, PRICE $2,500; DEERE-CLARK MOTOR CAR CO., MOLINE, ILL.

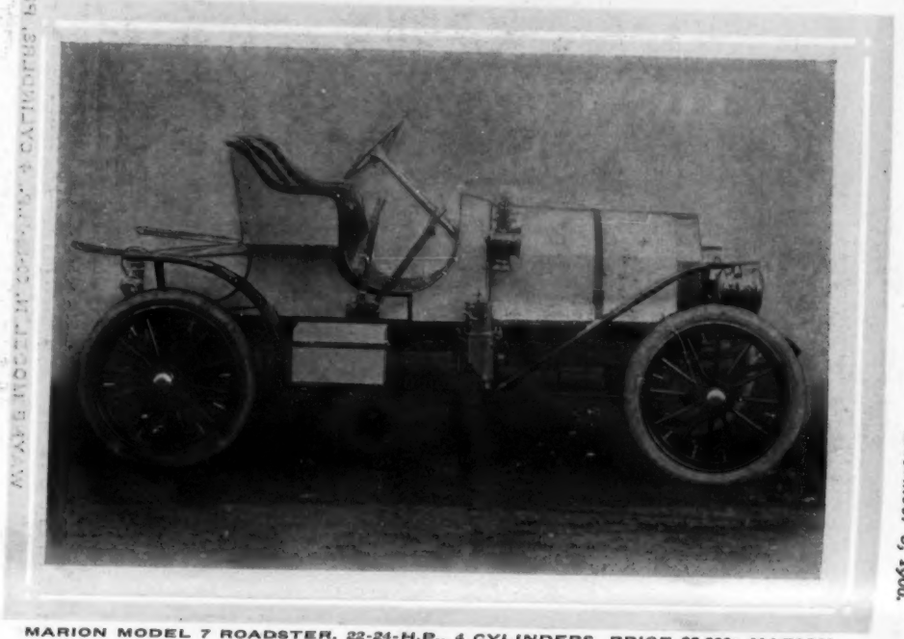
ST. LOUIS, 35-40-H.P., 4 CYLINDERS, PRICE $2,250; ST. LOUIS MOTOR CAR CO., PEORIA, ILL.



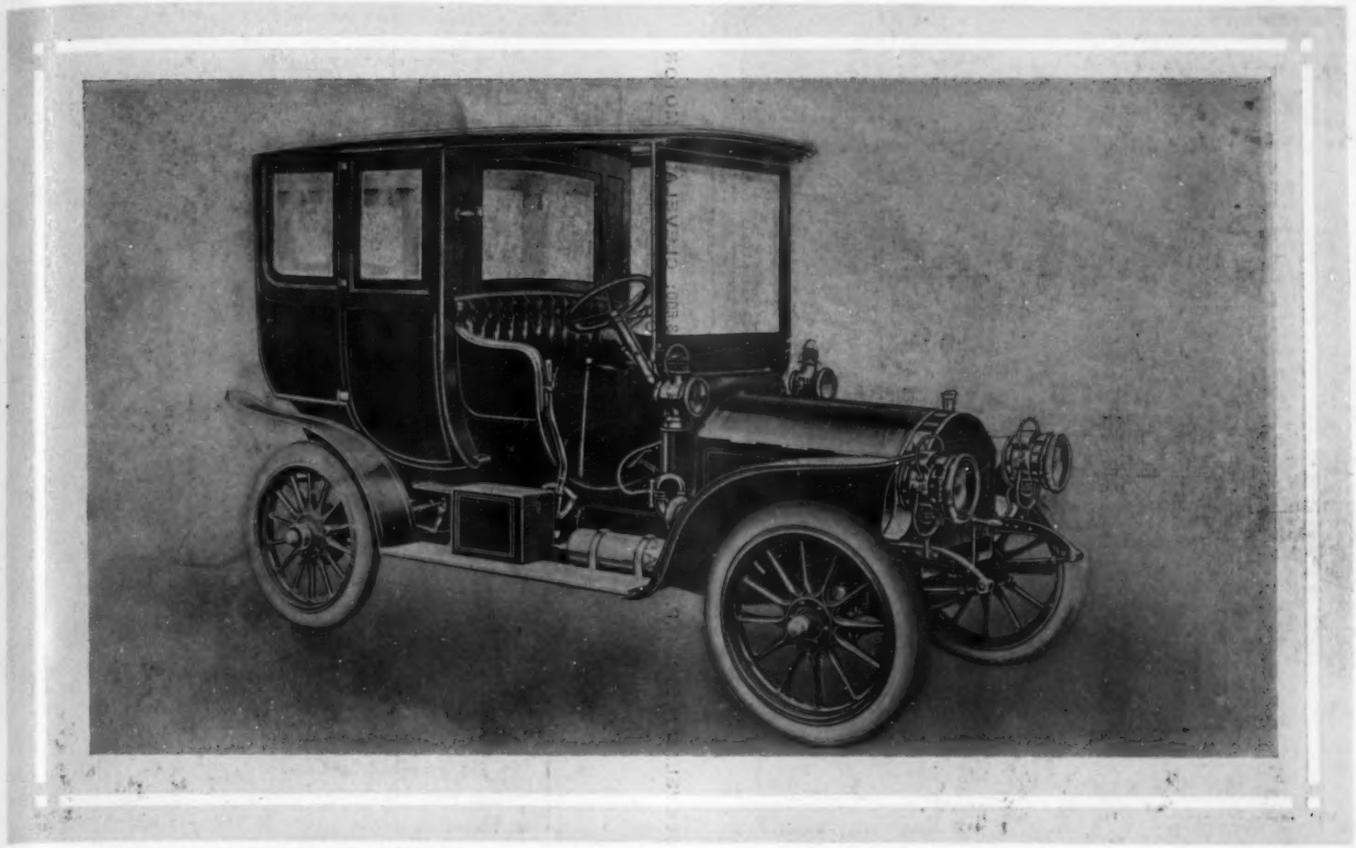
PREMIER MODEL 24, 24-28-H.P., 4 CYLINDERS, PRICE $2,250; PREMIER MOTOR CAR CO., INDIANAPOLIS, IND.



WHITE STEAMER MODEL H, 20-H.P., 2 CYLINDERS, PRICE $2,500; THE WHITE CO., CLEVELAND, O.



MARION MODEL 7 ROADSTER, 22-24-H.P., 4 CYLINDERS, PRICE $2,000; MARION MOTOR CAR CO., INDIANAPOLIS, IND.

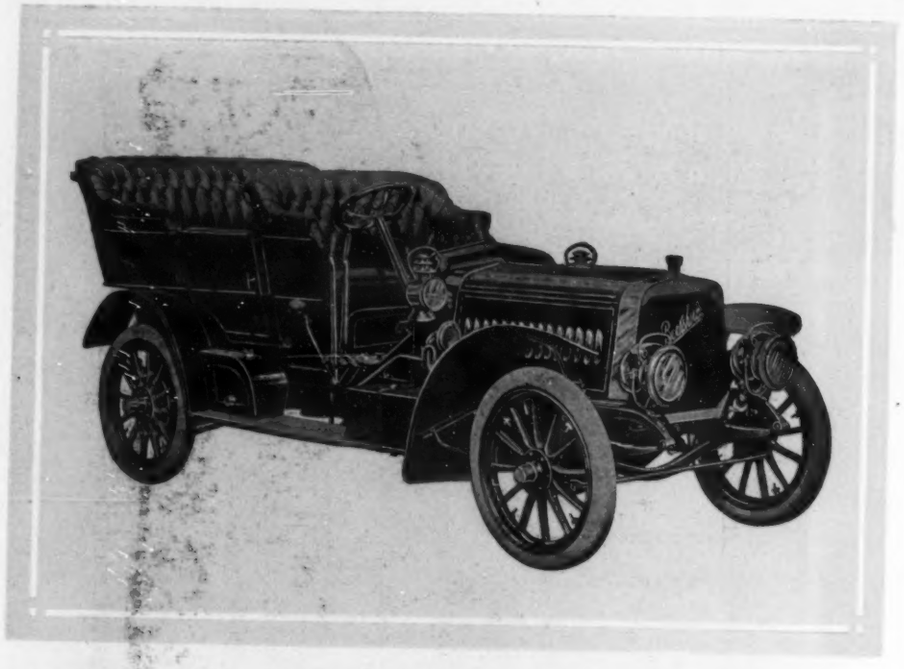


STODDARD-DAYTON LIMOUSINE, 18-H.P., 4 CYLINDERS, PRICE $3,500; DAYTON MOTOR CAR CO., DAYTON, O.

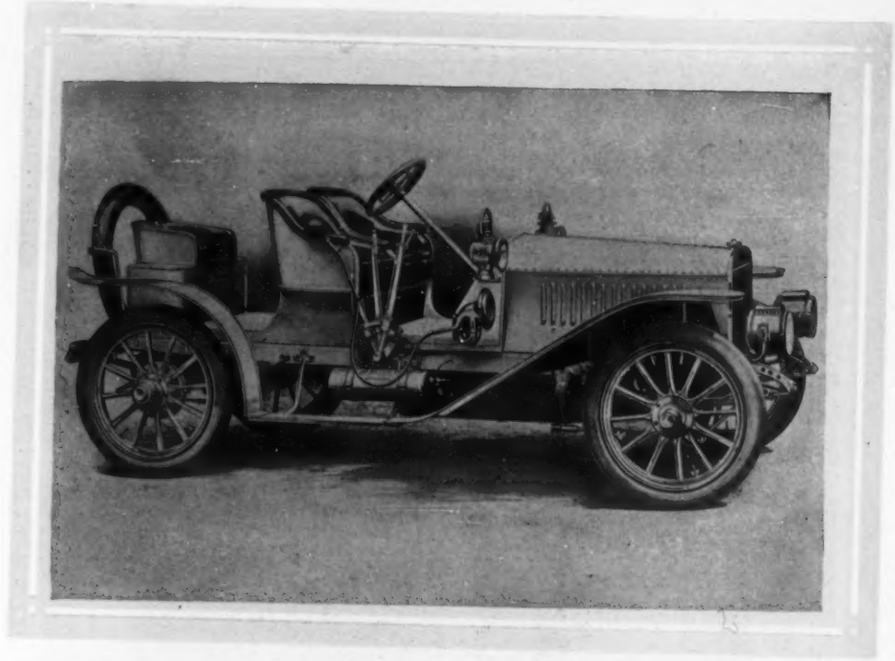
REO LIMOUSINE, 16-20-H.P., 4 CYLINDERS, PRICE $2,500; REO MOTOR CAR CO., LANSING, MICH.

MARION MODEL 7 ROADSTER, 22-24-H.P., 4 CYLINDERS, PRICE $2,000; MARION MOTOR CAR CO., INDIANAPOLIS, IND.

WHITE STEAMER MODEL H, 20-H.P., 2 CYLINDERS, PRICE $2,500; THE WHITE CO., CLEVELAND, O.

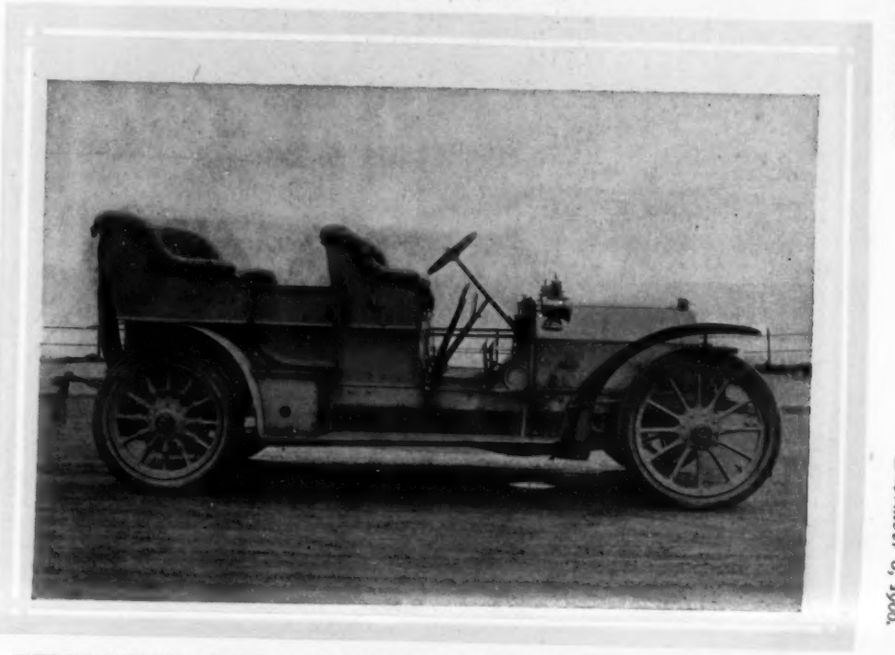


BERKSHIRE, 35-H.P., 4 CYLINDERS, PRICE $3,500; BERKSHIRE AUTOMOBILE CO., PITTSFIELD, MASS.

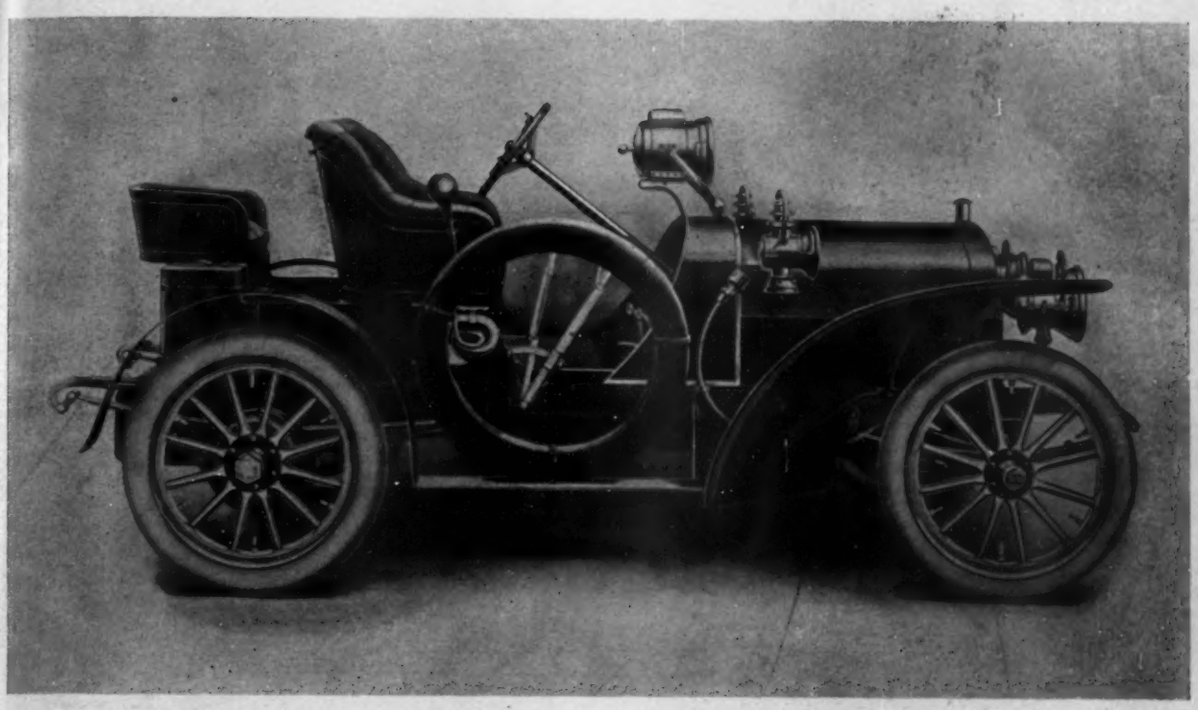


CLEVELAND, 30-35-H.P., 4 CYLINDERS, PRICE $3,500; CLEVELAND MOTOR CAR CO., CLEVELAND, O.

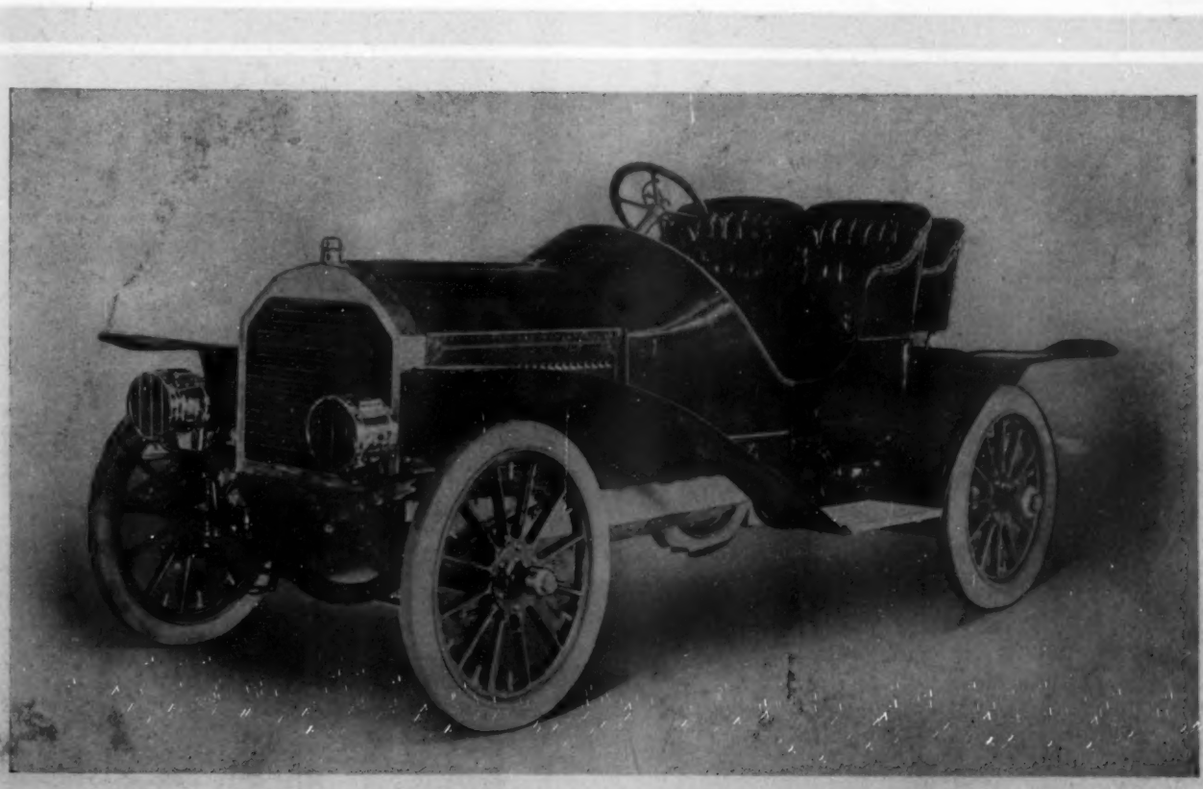
NATIONAL MODEL F, 40-H.P., 4 CYLINDERS, PRICE $5,000; NATIONAL MOTOR VEHICLE CO., INDIANAPOLIS, IND.



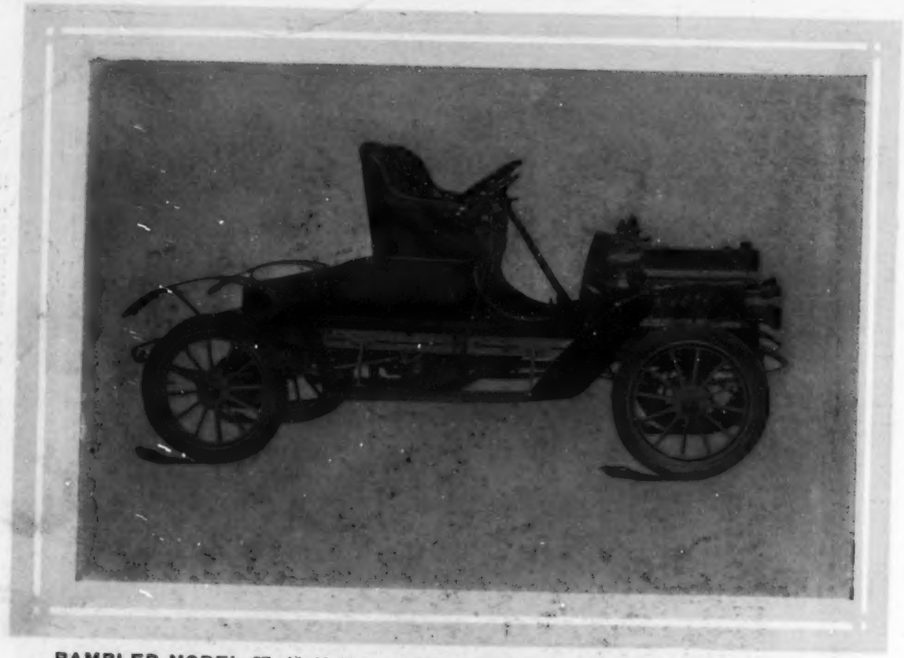
WESTINGHOUSE, 40-H.P., 4 CYLINDERS, PRICE (CHASSIS) $7,500; SOCIETE ANONYME WESTINGHOUSE, NEW YORK CITY.



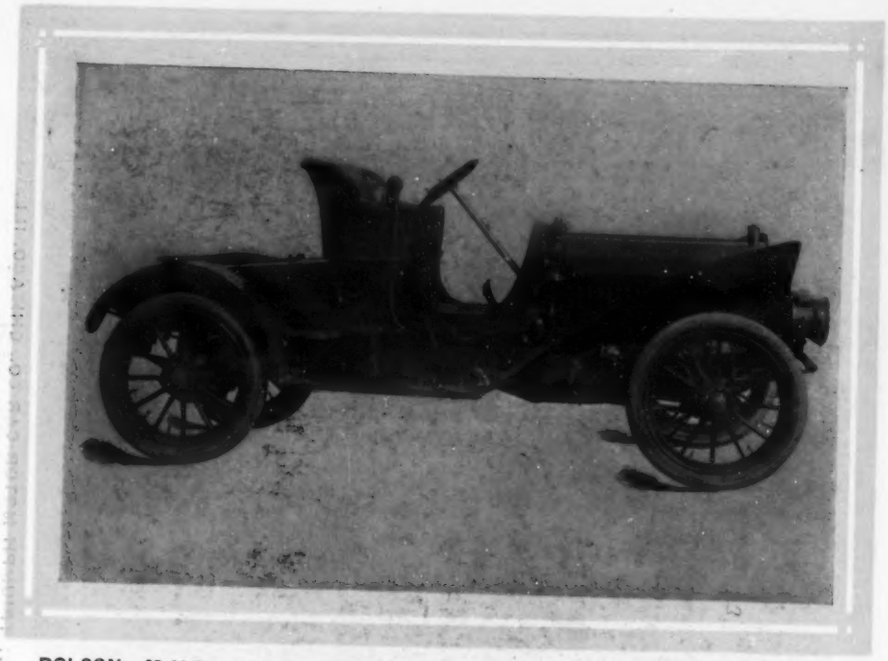
TRIUMPH, 30-H.P., 4 CYLINDERS, PRICE $2,800; TRIUMPH MOTOR CAR CO., CHICAGO, ILL.



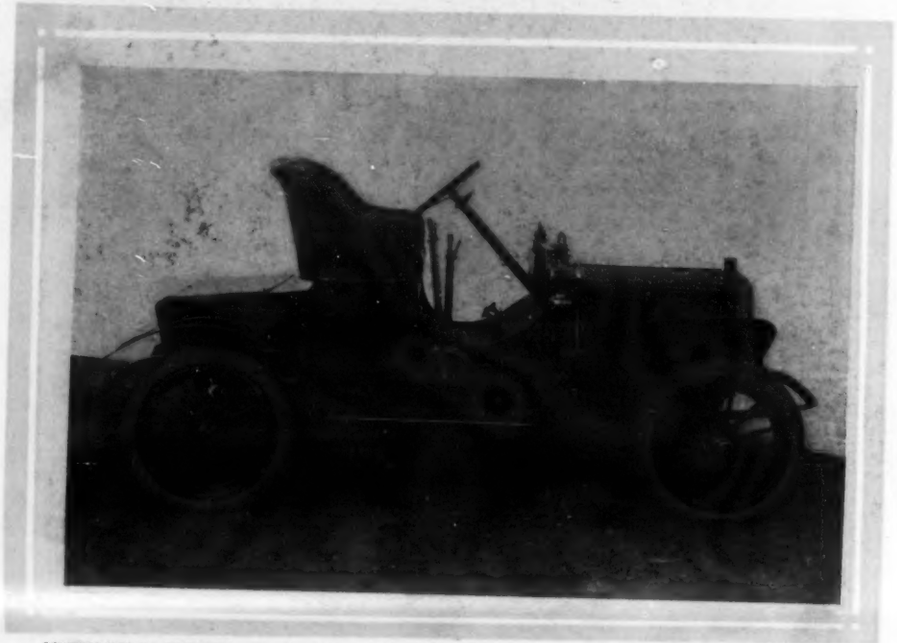
FRONTENAC, 40-H.P., 4 CYLINDERS, PRICE $3,500; ABENDROTH & ROOT MFG. CO., NEWBURG, N. Y.



RAMBLER MODEL 27, 14-16-H.P., 2 CYLINDERS, PRICE $950; THOS. B. JEFFERY & CO., KENOSHA, WIS.



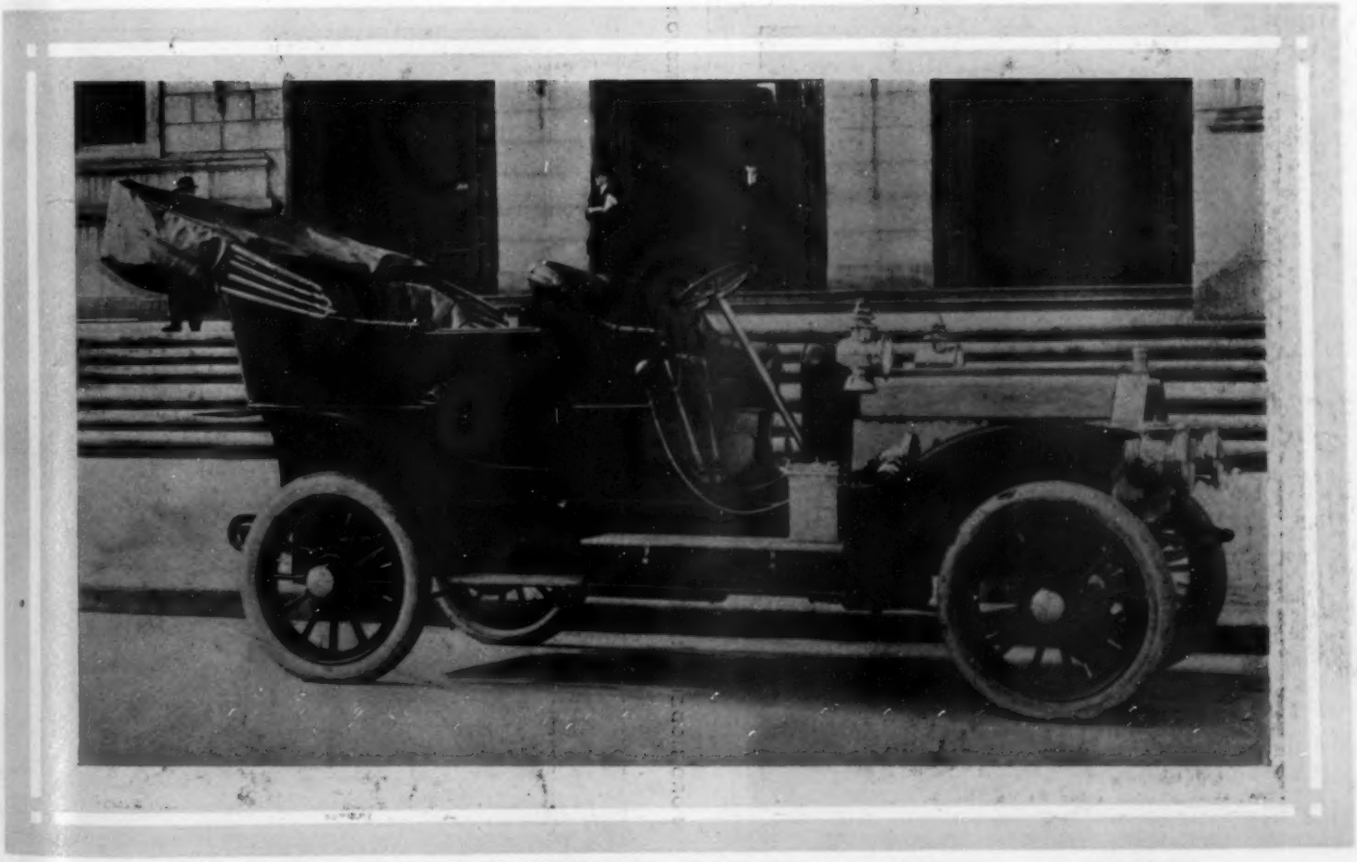
DOLSON, 35-H.P., 4 CYLINDERS, PRICE $2,500; DOLSON AUTOMOBILE CO., CHARLOTTE, MICH.



MITCHELL MODEL E, 20-H.P., 4 CYLINDERS, PRICE $1,000; MITCHELL MOTOR CAR CO., RACINE, WIS.

MAXWELL MODEL R S, 12-H.P., 2 CYLINDERS, PRICE $825; MAXWELL-BRISCOE

LAMBERT MODEL F, 35-40-H.P., 4 CYLINDERS, PRICE $3,000; BUCKEYE MFG. CO., ANDERSON, IND.



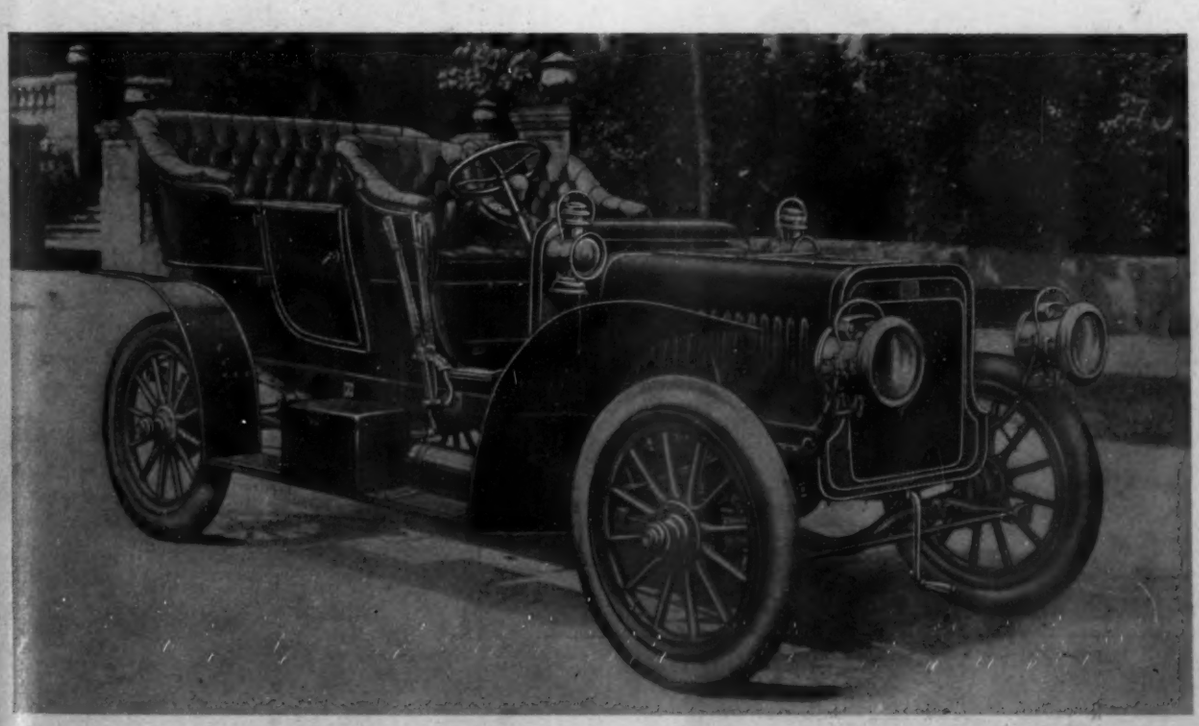
GROUT, 30-35-H.P., 4 CYLINDERS, PRICE $2,500; GROUT BROS. AUTOMOBILE CO., ORANGE, MASS.

LOGAN, 20-24-H.P., 4 CYLINDERS, PRICE $1,500; LOGAN CONSTRUCTION CO., CHILLICOTHE, O.

FORD MODEL N RUNABOUT, 15-H.P., 4 CYLINDERS, PRICE $500; FORD MOTOR CO., DETROIT, MICH.

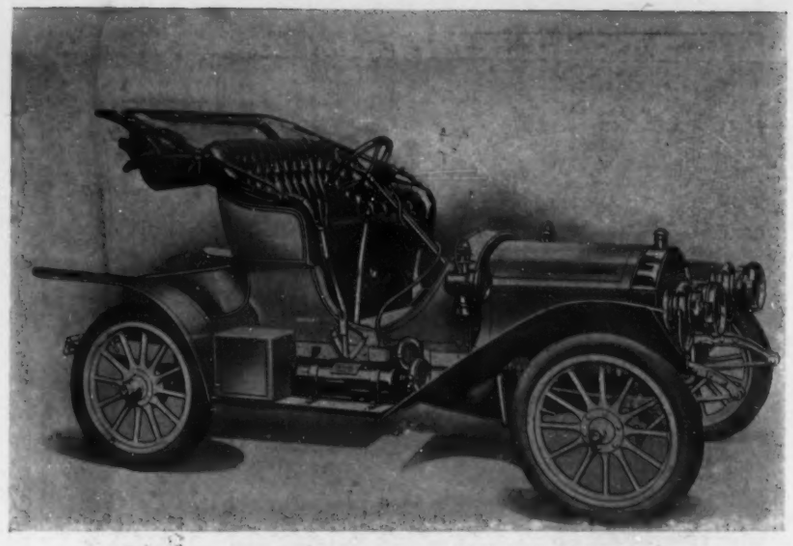
DURYEA, 28-30-H.P., 2 CYLINDERS, PRICE $2,500; DURYEA POWER CO.,

CRAWFORD MODEL E, 35-H.P., 4 CYLINDERS, PRICE $2,500; CRAWFORD AUTOMOBILE CO., HAGERSTOWN, MD.

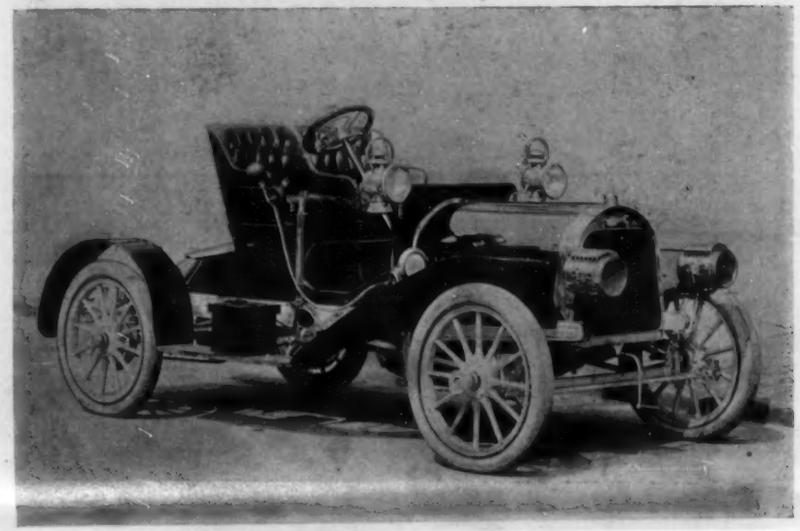


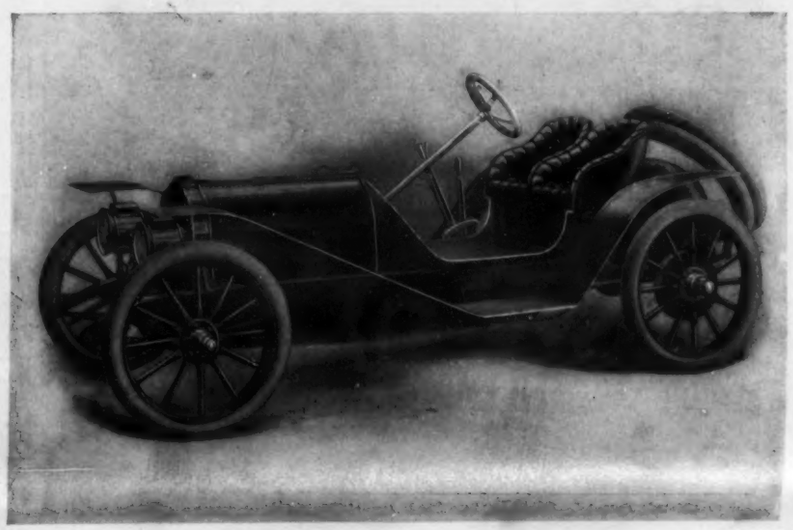
MOLINE MODEL A, 35-H.P., 4 CYLINDERS, PRICE $2,500; MOLINE AUTOMOBILE CO., EAST MOLINE, ILL.

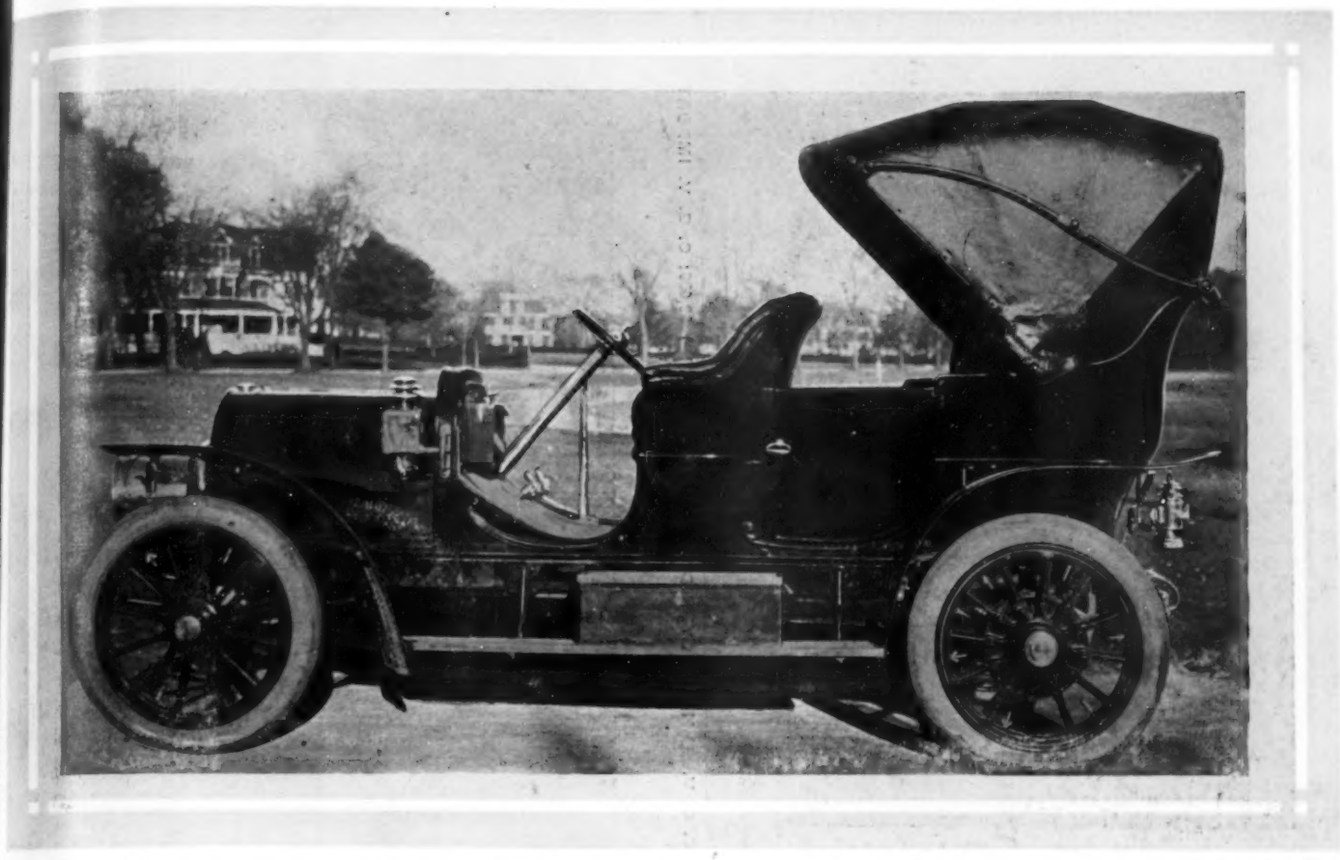
REO RUNABOUT, 8-H.P., 1 CYLINDER, PRICE $675; REO MOTOR CAR CO., LANSING, MICH.



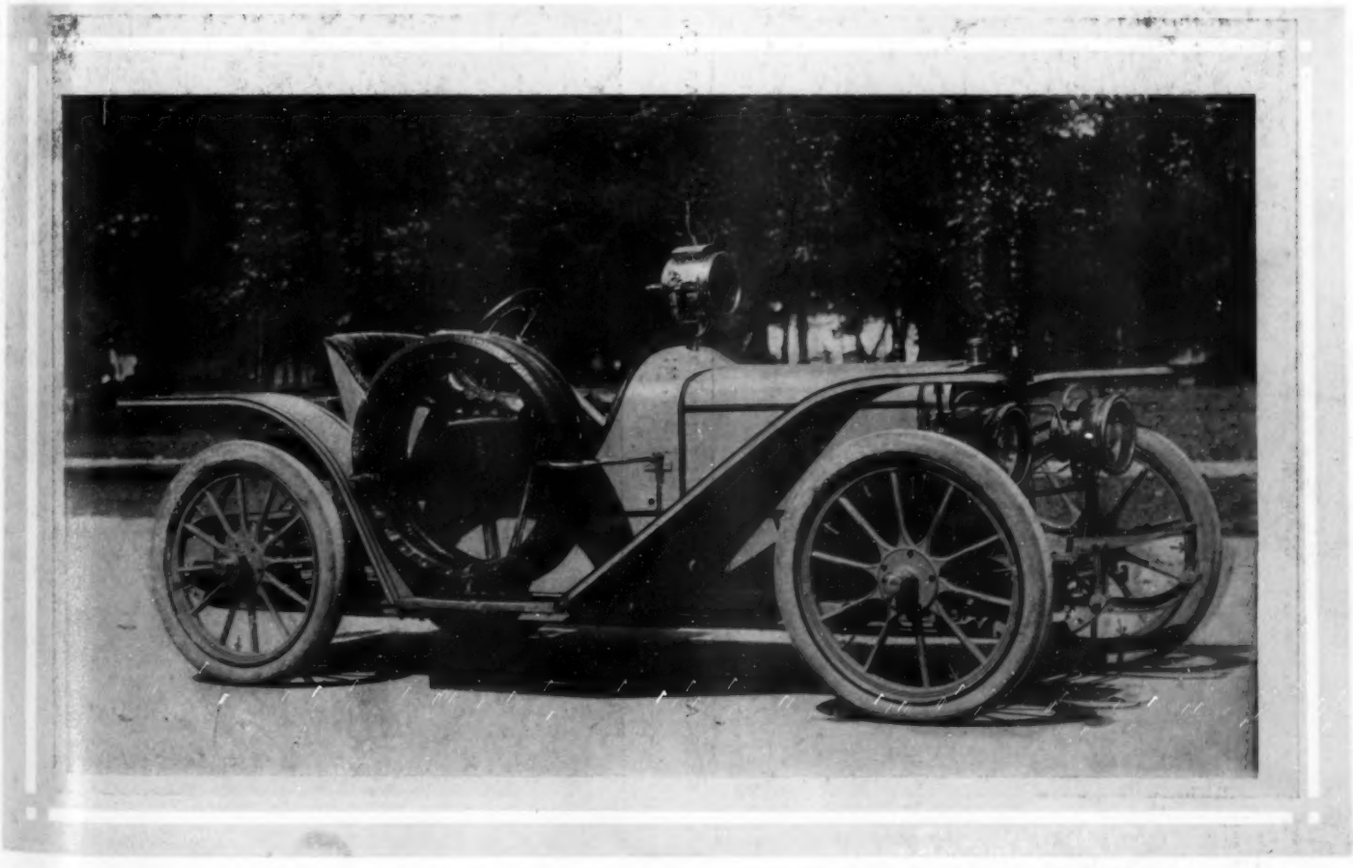
STODDARD-DAYTON MODEL H, 15-18-H.P., 4 CYLINDERS, PRICE $1,750; DAYTON MOTOR CAR CO., DAYTON, O







MOORE, 40-H.P., 4 CYLINDERS, PRICE $6,000-$8,000; MOORE AUTOMOBILE CO., NEW YORK CITY.



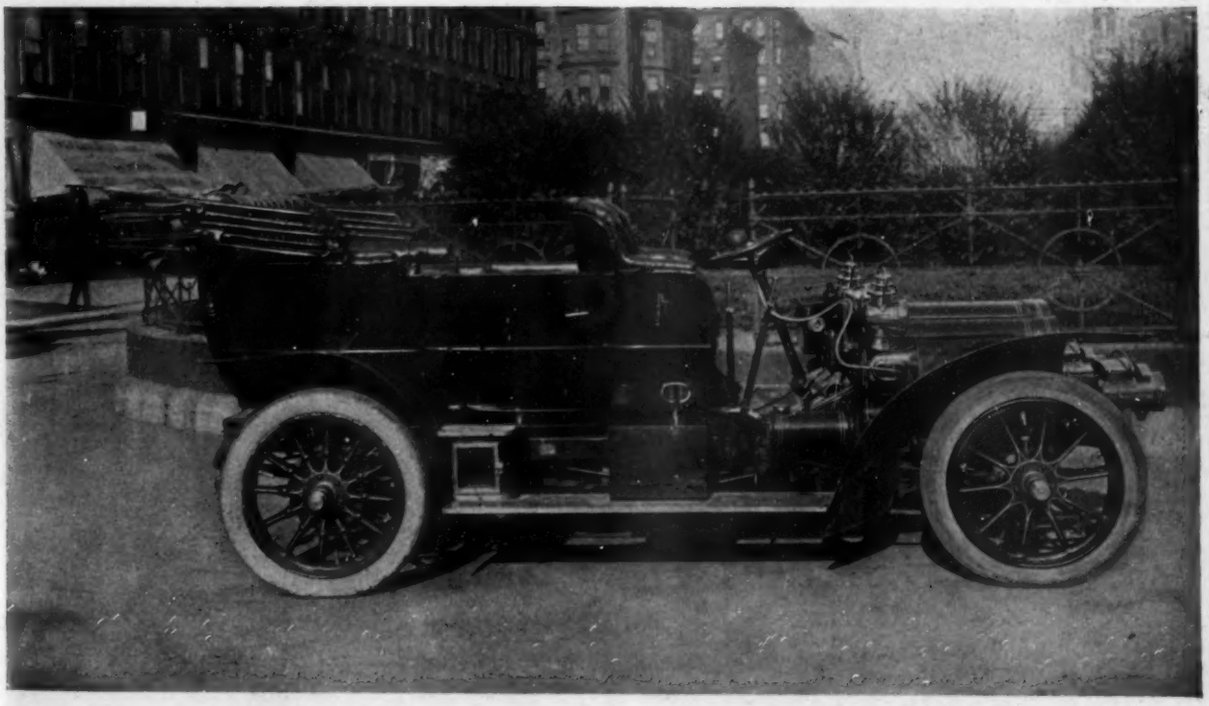
AMERICAN ROADSTER, 40-45-H.P., 4 CYLINDERS, PRICE $3,250; AMERICAN MOTOR CAR CO., INDIANAPOLIS, IND.

C. G. V., 50-H.P., 4 CYLINDERS, PRICE (CHASSIS) $9,000; C. G. V. IMPORT CO., NEW YORK CITY.

AEROCAR MODEL C, 20-H.P., 4 CYLINDERS, PRICE $2,000; AEROCAR CO., DETROIT, MICH.

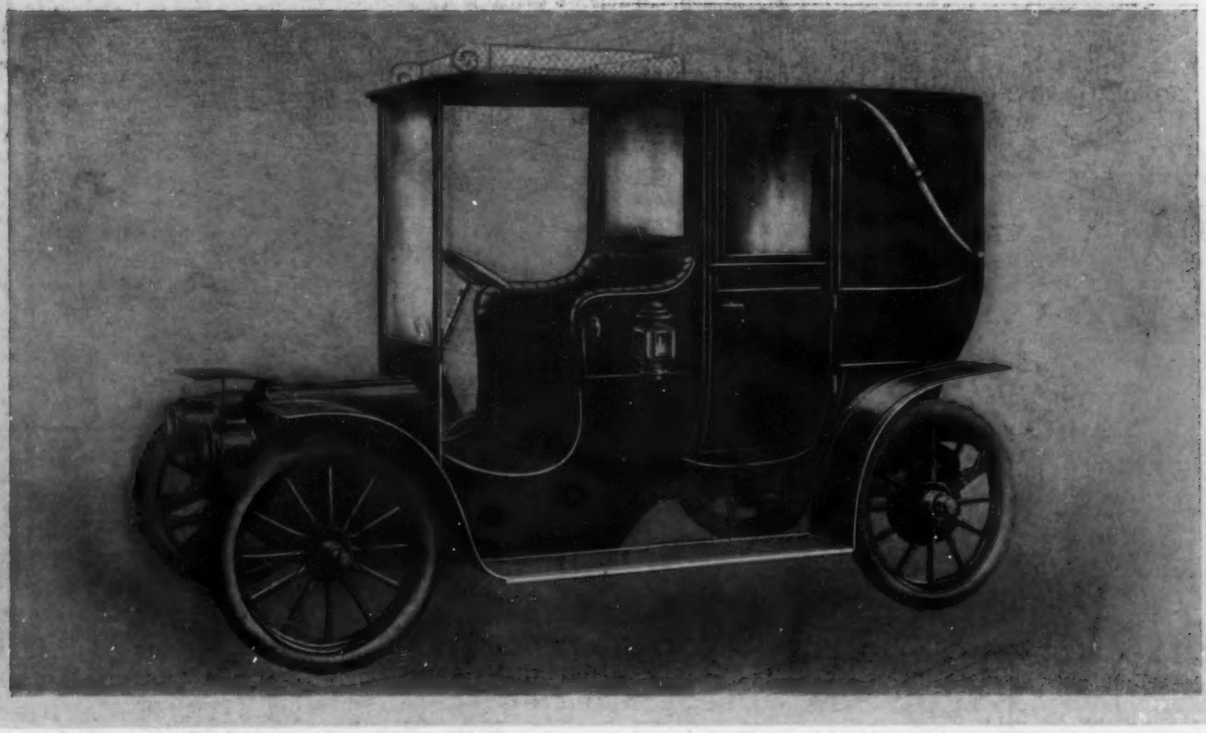
LAMBERT MODEL J, 35-40-H.P., 4 CYLINDERS, PRICE $1,800; BUCKEYE MFG.

DELAHAYE, 25-35-H.P., 4 CYLINDERS, PRICE (CHASSIS) $7,500; DELAHAYE & PILAIN AGENCY, NEW YORK CITY.



MORS, 45-60-H.P., 4 CYLINDERS, PRICE (CHASSIS) $7,500; CRYDER & CO., NEW YORK CITY.

HOLSMAN MODEL 9, 10-H.P., 2 CYLINDERS, PRICE $650; HOLSMAN AUTOMOBILE CO., CHICAGO, ILL.



B-L-M LANDAULET, 16-H.P., 4 CYLINDERS, PRICE $4,500; BREESE, LAWRENCE & MOULTON, BROOKLYN, N. Y.

MEAGER SPACE FOR COMMERCIAL VEHICLES

By W. P. STEPHENS.

THE growing importance of the commercial vehicle was emphasized by the fact that, instead of being represented by isolated exhibits placed out of the way in a basement or here and there in the main exhibit of pleasure cars, an attempt was made to segregate the working cars in a space specially set apart for them on the gallery floor. Unfortunately the conditions are not favorable for such an exhibition, the space itself is too limited and as all exhibits have to be hoisted by means of an elevator, the leviathans of the class are missing. The exhibit falls far short of being representative in point of numbers and variety of the commercial vehicle of 1907, but the various cars bear testimony to the many business uses of the modern automobile.

Rapid Motor Vehicle Company.—This exhibit includes six different cars. The motive power is a four-cycle, two-cylinder horizontal opposed type engine, in a general way of the conventional form, but carefully designed in detail with many special features. The various materials for the motor and other parts, steel iron and bronze, are subjected to the same chemical analysis and test as are used in some of the higher grades of pleasure cars, and a similar high standard of mechanical work is maintained in the construction. The cylinders are 5 by 5 inches, giving 22 to 24 horsepower.

Atlas Gasoline Trucks.—Compact, sturdy and massive in its members and plain in the extreme in finish, the new Model C chassis of the Knox Motor Truck Company stands out as an embodiment of simplicity and power. The two-cylinder engine shows little more than a plain heavy casting in black with no valves, springs, polished surfaces or bright copper tubing; a modification of the two-stroke type with exhaust escaping through four rectangular ports cast in the head of the piston, all communicating with a circular opening in the center of the head. By way of demonstration car the company has in the street one of the Model B cars which has been run continuously over a large part of New England.

Logan Construction Company.—The large line of Logan commercial vehicles is represented by but two cars, one being the complete Model N 1,200-pound delivery, already well known. The other is the new Model M, a powerful and strongly built machine fitted to carry any sort of body within its capacity of three tons; it is shown without body. The transmission is of the Pleukharp type, bevel gear, and direct drive on both of the two forward speeds and the reverse; all gears being in mesh at the same time. The engine gives 30 horsepower at 810 revolutions.

Frayer-Miller Truck.—This car was shown with the others of the Oscar Lear Automobile Company exhibit on the main floor; it has a capacity of 2 1-2 tons, with a wheelbase of 112 inches and a tread of 66 inches. The mechanism includes the engine, transmission and rear axle, with bevel-gear drive, of the 24-horsepower touring car, these being attached to the steel frame in such a manner that the rear axle becoms the jackshaft, carrying sprockets for the chain-drive to the rear wheels in the usual manner. There are thus the regular four speeds and reverse, with a range of from 4 to 16 miles with load. Ball bearings are used to support the jackshaft. The platform is 12 feet by 53 inches.

Commercial Truck Company of America.—The larger of the two electric exhibits is the four-motor, four-wheel-drive truck made by this company, a five-ton brewery truck of four tons weight. The motors, one driving direct on each of the four wheels, are swung on bearings in the yokes formed in each end of the cast bronze axles, with steering gear connected to rear as well as front wheels, to be disconnected at will. The speed is 6 miles, with a radius of 30 miles. This particular truck is fitted with rubber tires, but a stake truck, also shown, has wooden tires. In the street is a 35-passenger car with wooden tires.

Lansden Electric Wagon.—The Lansden Company, of Newark, N. J., shows one of its lighter delivery wagons with express body. The frame is of the armored type and the single motor may be slung at any convenient point, driving by a single chain to a differential on a jackshaft and thence in the usual way by side chains to the rear wheels. The entire construction is very simple and any form of body may be fitted to the standard chassis.

Torbensen Gear, Inc.—A chassis is shown with the engine and transmission made by this company. The engine is four-cycle, two-cylinder, double-opposed, lying across the front of the chassis and driving by a central shaft. The cylinders are 5 1-8 inches bore by 4 1-2 inches stroke, air-cooled by means of cast fins on cylinders and valve chambers. The gas inlet passes over the exhaust passage, thus aiding in cooling the exhaust. The regular Torbensen transmission has been improved in detail; there is a solid fixed rear axle with drive by means of an internal spur gear on each wheel.

American Motor Truck Company.—A five-ton stake truck is shown, the mechanism being practically unchanged from last year. The cooling system has been improved by means of an extra coil of piping at the rear end of body.

SHOCK ABSORBERS ARE INCREASING IN FAVOR

Truffault-Hartford.—The 1907 model of this standard device shows several new features; the three arms are made absolutely interchangeable, the tension has been increased from 32 to 55 pounds, the lubrication is automatic, and an improved means of attachment has been provided. As now made the device is guaranteed for 10,000 miles without readjustment.

Foster Shock Brake.—This device is made by the Gabriel Horn Manufacturing Company. It is on the dashpot principle, a plunger with a simple form of valve working in a cylinder of cold-drawn steel tubing filled with oil. The cylinder is attached to the lower part of the spring and the plunger to the car; as the springs come together on a jolt the oil passes freely through small holes in the plunger, but the return is retarded by a falling ring over the holes, cushioning the plunger.

Diezemann Shock Absorber.—Two demonstration models of this device are shown; springs with the absorber attached, as though in actual use, the springs being compressed by a lever and suddenly released. The action with the absorber connected is shown and then the connection is broken and the spring left free to vibrate. The friction disks are packed with grease, so that the device is entirely automatic in its lubrication.

J. H. Sager Company.—The Sager equalizing springs are shown in two models, the original equalizing spring placed

over the center of the main spring, and a new form of suspension spring intended to ease the motion of short, stiff springs. This latter is placed between the end of the chassis and the end of the spring, in place of the ordinary link, adding greatly to the elastic qualities of the spring.

RADIATORS.

Briscoe Manufacturing Company, Detroit, Mich.—This exhibit includes the large line of sheet-metal goods manufactured by the company—radiators, fenders, bonnets, tanks, dashes, etc. The demand for a more efficient fender has been met in the 1907 model, with extra wings to fit the space betwen main fender and body. Both the honeycomb and the flat tube are shown, also models for trucks and the lower-priced cars.

Whitlock Coil Pipe Company, Hartford, Conn.—The Whitlock coolers are shown in various shapes and sizes, and in the honeycomb, tube and fin and cellular types. There are no important changes being made in the manufacture except in increased general neat appearance.

BRONZE, ALUMINUM, AND OTHER CASTINGS.

Cramp & Sons Ship and Engine Building Co., Philadelphia.—A large and attractive exhibit of castings of Parson's manganese bronze for automobile parts, such as connecting rods, gear cases, steering gear parts, gears, knuckles, I-beam axles, wheels, and so on, this material being remarkably strong and tough and easily cast into forms that could not be forged commercially. Also castings of Parson's white brass, a bearing metal that is very extensively used in high-class engineering work.

Light Manufacturing and Foundry Company, Pottstown, Pa.—Aluminum and aluminum alloy castings for crankcases, gearcases, and the very many automobile parts that are commonly made of aluminum and its alloys. A number of particularly fine specimens of crankcase work are shown, some being machined to show the closeness of the grain of the metal and its freedom from flaws and blow-holes.

Manufacturers' Foundry Company, Waterbury, Conn.—A collection of cylinder castings for gasoline motors, a branch of the automobile industry of which this concern makes a specialty. Cylinder castings of very intricate form were exhibited and parts were cut away to show the smoothness of the work, the freedom from holes and bad spots and the uniformity of thickness of the metal in the thinner places. The company is prepared to machine cylinders and to test them under water pressure.

EXHIBITS OF VARIOUS KINDS.

Sprague Umbrella Company, Norwalk, O.—A number of improvements have been made in the Sprague automobile tops shown. All these tops are now shown fitted with Col. Sprague's new forged steel bow sockets. A feature of these tops is that all the bows are in line with each other and when folded the bows are kept apart by rubber bumpers which not only prevent rattling and noise, but avoid chafing the folds of fabric and also present a very neat and compact appearance. Another new specialty is a divided glass front supported by brass rods. When it is desired to lower the upper half, pins at the ends come out of their sockets, when the top is lifted and the top half is then lowered just back of the lower half, the pins entering lower sockets and holding securely. The whole arrangement is exceedingly neat and compact.

Wray Pump and Register Company, Rochester, N. Y.—This concern exhibits a varied assortment of tire pumps, jacks, and other automobile specialties. There is a particularly interesting series of Kellogg pumps, including the double-acting compound pump, a multiple gear compound pump with register, and the Kellogg single-acting pump. Also Wray collapsible compound pumps, triplex compound pumps, pressure registers, multiple gear jacks and patent couplings. A very ingenious affair is the Wralog pneumatic jack, on which the load is raised by an air pump delivering air into the jack cylinder under the piston. This jack is remarkably smooth and easy in its action.

Charles E. Miller, New York City.—The large line of Miller specialties is shown prominently as usual; an addition is a new speedometer registering to 60 miles. It is shown running, the dial registering accurately at speeds down to one and two miles. A new jack, small and light but of one ton capacity, is shown. The Brampton chains, in standard sizes to fit both American and foreign cars, form a prominent feature of the exhibit. The Pan-American body polish is now regularly handled by Mr. Miller.

J. M. Quinby & Co., Newark, N. J.—A 35-horsepower Fiat chassis is shown with a limousine body fitted with more than usual completeness, including full electrical equipment. A 50-horsepower Matheson chassis is fitted with a touring body with four-bow extension top and a similar body and top are fitted to a 30-horsepower S. & M. Simplex chassis. As the colors and upholstery are entirely different in these two cars, a very pleasing contrast is presented.

Standard Welding Company, Cleveland, O.—The well-known specimens of electric welding are shown in increasing variety to fit the growing application of this important process.

L. J. Mutty Company.—Specimens of the top cloths and other automobile fabrics, domestic and foreign, handled by this company, are shown at the stand of the Detroit Motor Car Specialty Company. These fabrics are used for tops, seats, backs, bags, etc. A specialty is the cloth coated with fine Para rubber.

Midgeley Tubular Steel Wheels, Columbus, O.—These wheels are now made with holes so that any standard hub may be bolted on by the maker where it is not convenient to have them brazed on at the factory. The works are now busy with the special rims for Dunlop tires.

Uncas Specialty Company, Norwich, Conn.—The different Leavitt timers are shown, including the Lacoste pattern roller timer with ball bearings. These in two sizes, for four-cylinder and six-cylinder engines, are shown running; one is completely immersed in a vessel of water, showing the perfect insulation, the other is immersed in oil, showing the perfection of the contact. This timer is provided with a supplementary ground, obviating all danger of failure. The timers are made with the ball bearings and with plain bearings. The seven horns are shown, with a new attachment, a bracket easily fastened to the car and carrying a leather friction roller which may be adjusted to any one of four positions, a spring lock washer holding the bolt in place. A new gasoline separator for cars and launches is shown, a cup with gauze filter, the two sections joined by a taper screw and requiring no packing.

Kinsey Manufacturing Company, Dayton, O.—The Kinwood specialties are shown, including the mechanical oilers, radiators in several new models and sizes, and a new muffler and cutout. A new tank is shown, with sides and top of tin or galvanized iron and bottom and lower part of sides of brass or copper. These are less costly than all copper or brass tanks and yet there is little chance for corrosion.

MOTORCYCLES FOR 1907 AS SEEN AT THE SHOW

PERHAPS the coming year will see more radical changes in the leading American motorcycles than any other time since the sport became to any extent a popular one. These changes are in the line of longer wheelbases, larger tanks, the more universal adoption of pump feed, and in one case the introduction of the mechanically-operated inlet valve. As yet the magneto has only been adopted on one American machine which, however, is built on strictly French lines.

The Hendee Manufacturing Company.

This company has for some time past promised a number of surprises and they have certainly kept their promise. To begin with, the wheelbase has been lengthened about four inches, the capacity of the gasoline and oil tanks has been enlarged, the former to over five quarts and the latter to about a quart, or enough for 500 miles. There is also fitted a pump feed for the oil and a new carbureter which has an air lever with a horizontal spindle. This lever does not move with the throttle, and is held in place by a pin forced into a series of holes by a spring. A new fastening for the inlet valve dome is also shown, and a larger and improved muffler. Their most radical change, however, is the use of a roller pinion drive in place of the short chain heretofore used to transmit the power to the countershaft. This is entirely enclosed in a dustproof case. Roller chains are used for both the motor and pedaling chains. There is also an improved coaster brake used. This company shows a single machine and two tri-cars, one for a passenger, and the other for parcel delivery.

Prospect Motor Manufacturing Company.

In strong contrast to the Indian is the Simplex motorcycle built by the Prospect Motor Manufacturing Company, of Brooklyn. This machine is furnished with a twin cylinder machine of about 5 horsepower, the cylinders being 70x80 millimeters. The motor is made from French parts assembled in this country. Transmission is by V belt to the rear wheel. A back pedaling band brake is fitted, which is extremley powerful. The control is by double grip exhaust valve, controlled by right grip by means of a Bowden wire, the left being a switch grip. The machine is fitted with a combined stand and luggage carrier. A magneto is fitted as an option for an additional price. This company also makes a racer which weighs 110 pounds.

The Aurora Automatic Machinery Company.

This concern, makers of the Thor motor, shows a machine assembled from their parts. The most notable changes this year are a muffler for which great things are claimed in the elimination of back pressure, and the makers show their faith in these claims by not providing it with a cutout. The motor is not changed to any great extent, the changes being confined to the accessories. The carbureter is altered considerably, and the throttle is operated by a grip control through a double wire mechanism of the Bowden type. A pump feed is used instead of the measuring cup.

Reading Standard Cycle Manufacturing Company.

This concern shows three separate and distinct models of roadsters. Model A, fitted with the improved R. S. motor of 3 horsepower. Model B, fitted with the Thor motor, and Model C, a combination tandem fitted with the R. S. motor. The R. S. motor is very conservatively rated at 3 horsepower, and is fitted with a mechanical inlet valve. The carbureter is rather novel in its outward appearance, being of somewhat the shape of an opera glass. The oiling device is very simple and ingenious. A measuring cup is used, but it is connected to the oil tank by a large pipe through which passes the rod operating the bottom valve. This pipe also serves as an air vent. The operating rod also operates the top valve, and the device is so arranged that both valves cannot be open at the same time. It is therefore only necessary to habitually keep the top valve open and then the cup will always be filled ready to oil the motor. A simple half turn of the operating rod allows the charge of oil to run into the motor. This machine is also provided with a neat battery box, in which any ordinary standard cell may be used. The crankshaft for the pedaling chain and the motor countershaft are mounted on separate eccentric hangers. The Model B employs the Thor motor and parts, but has many distinctive features about it. Model C is a combination tandem and has the same motor equipment as Model A.

G. H. Curtiss Manufacturing Company.

This concern shows a single and double cylinder machine which is practically unchanged from the 1906 model, except that there is fitted in some cases a combined stand and luggage carrier. The machines are fitted with V-belt transmission sight feed oilers, and in the case of their twin cylinder machines, with double coil and battery. The Curtiss Company has a very interesting exhibit of lightweight motors for aeronautical purposes in the Aero Club's exhibit.

The Consolidated Manufacturing Company.

This company is the maker of the Yale California, and shows two machines which are on about the same general lines as the 1906 models. A new type of spring fork has been adopted which may be said to consist of two forks, the rear one which is direct connected to the head, and a forward one which is connected at its lower ends to the wheel. This is connected to the rear portion of the fork by means of a system of links similar to that employed in an old-fashioned parallel ruler. Other features such as the broad, flat belt combined with the spring idler and the large outside flywheel have been retained. A cylindrical gasoline tank has also been adopted, and an improved motion to their grip control so that it will tend to stay in the position for which it has been set.

Wagner Motor Cycle Company.

This concern shows two models fitted with V-belt transmission. They seem to be identical with their 1906 models.

American Motor Company.

This concern makes the Marsh-Metz motorcycle. It shows a single machine and a fore car attachment. The main features of 1906 have been retained. The broad, flat belt, a double automatic valve carbureter, and the circuit breaker which dispenses with moving wires, a sliding contact being substituted. They have also substituted a large seamless tank of copper with rounded ends, which contains both the oil and the gasoline, as well as the oil pump and a needle valve gasoline cutoff which is contained wholly within the tank.

Ovington Motor Company.

This concern handles the F. N. four-cylinder motorcycle. The machine is quite remarkable in a good many ways, having an enclosed bevel-geared drive throughout and being ignited by a Simms Bosch high-tension magneto. Among the noticeable features of this machine are the spring fork which is said to be a revelation in the way of easy riding on rough roads, and a special flexible spring drive between the motor and the rear wheel. This concern showed a motor mounted on a table and driven slowly by an electric motor, the cylinders being cut away so as to show the operation of the pistons and valves in the cylinders as well as the sparking apparatus.

A GENERAL VIEW OF THE OLYMPIA SHOW, THE MOST SUCCESSFUL AUTOMOBILE EXHIBITION EVER HELD IN LONDON.

OLYMPIA'S EIGHT-CYLINDER ANTOINETTE ENGINE

LONDON, Nov. 24.—Olympia's third show under the auspices of the Society of Motor Manufacturers closed to-night after a most successful innings. Of the thousands that attended many were buyers and the manufacturers expressed themselves as more than gratified at the substantial results secured.

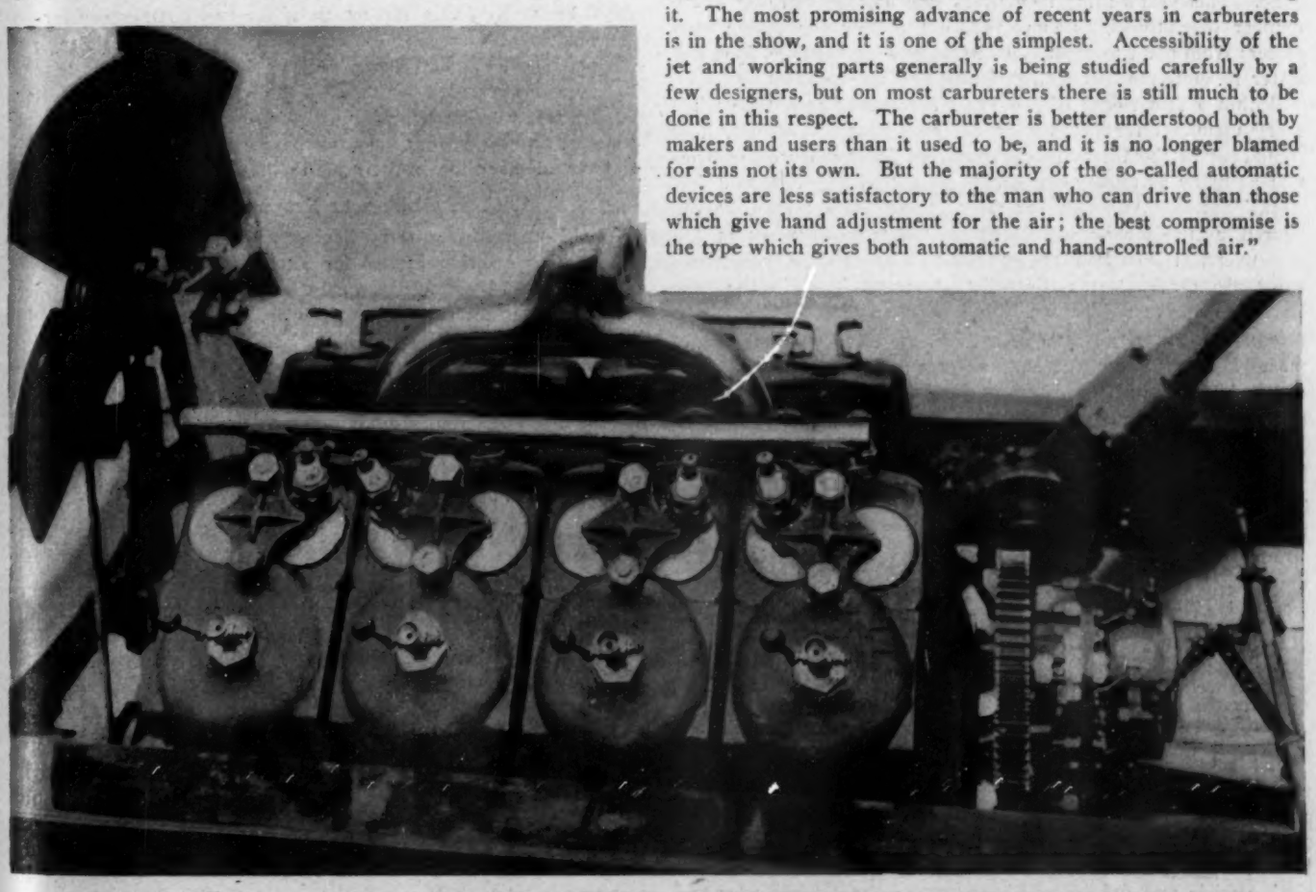
The eight-cylinder Antoinette engine of V-type, utilized by Santos-Dumont in his recent aeroplane flights, was unquestionably one of the most discussed things of the show. It was exhibited in an Adams-Hewitt car and has created something of a sensation. The particular feature of this engine is the absence of a carbureter, the fuel being injected directly into the air, either before or after it enters the cylinders, by the action of a minute plunger pump. By this scheme a positiveness of function practically impossible to secure with carbureters is said to be obtained, and the use of alcohol, kerosene and other liquid fuels beside gasoline is made much more practicable than it seems to be with the more common methods of fuel compounding.

It was an Antoinette motor, it will be remembered, that was used by Santos-Dumont in his recent remarkable achievement in aeroplane flight, and it is an Antoinette motor that holds the credit of the highest motor-boat speed ever attained—that of about thirty-three and one-fourth miles an hour, maintained by the motor boat *Antoinette* over a 120-kilometer course. Consequently, the entry of this marvelous new engine into the automobile field is regarded with the greatest interest by the whole motoring fraternity.

It is widely recognized that the carbureter, even in its best forms, claim some of the experts, tends to become increasingly inadequate as it is applied to multi-cylinder engines of many cylinders. The designer is left in a dilemma, no matter which of the two obvious courses he elect to pursue. If he use one carbureter, there is the trouble with various lengths and conformations of intake piping, resulting in some of the cylinders being furnished mixture less liberally than others; and if more than one carbureter be used, there is the extreme difficulty of adjusting them all so as to work exactly the same. In the Antoinette motors these troubles apparently are avoided by a cutting rather than an untying of the Gordian knot, and the single pump, which is easily made so as to deliver an invariably predetermined quantity of fuel at each stroke, is connected by piping and a simple distributer with the several cylinders, so that each has positively fed into it the exact amount of fuel required—no more, no less.

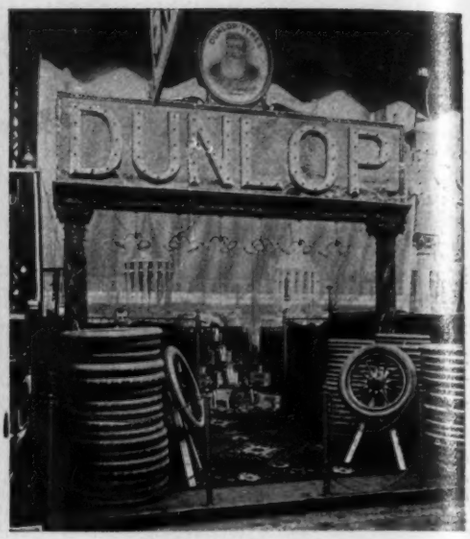
The idea is far from being so absolutely new as might be supposed from its constituting a novelty in the field of the present-day automobile engine. So long ago as 1901 the Gobron-Brillié car, of France, was fitted with a positive-measuring alcohol carbureter, the liquid fuel being trapped in small pockets on the surface of a rotating cone and from these pockets carried into the cylinders. In the United States thousands upon thousands of most successful kerosene stationary and marine engines work on the fuel-injection system, being pump fed in a manner similar to the method employed by Levavasseur, the designer of the Antoinette motors.

Commenting upon carbureters, the *Autocar* prints: "These are becoming simpler but more efficient. The very complicated types which have been introduced from time to time do not seem to have made much headway, as it has been found that the simpler devices, provided they were correctly proportioned to their work and properly adjusted, did all that the complex carbureters could do, and, what is more, they, once adjusted, would keep on doing it. The most promising advance of recent years in carbureters is in the show, and it is one of the simplest. Accessibility of the jet and working parts generally is being studied carefully by a few designers, but on most carbureters there is still much to be done in this respect. The carbureter is better understood both by makers and users than it used to be, and it is no longer blamed for sins not its own. But the majority of the so-called automatic devices are less satisfactory to the man who can drive than those which give hand adjustment for the air; the best compromise is the type which gives both automatic and hand-controlled air."



THE EIGHT-CYLINDER 35-40-H.P. ANTOINETTE ENGINE, EXHIBITED FOR THE FIRST TIME IN AN ADAMS-HEWITT CAR AT OLYMPIA.

ANOTHER STAND WHICH ARTISTICALLY TELLS OF NON-SKID BANDS.



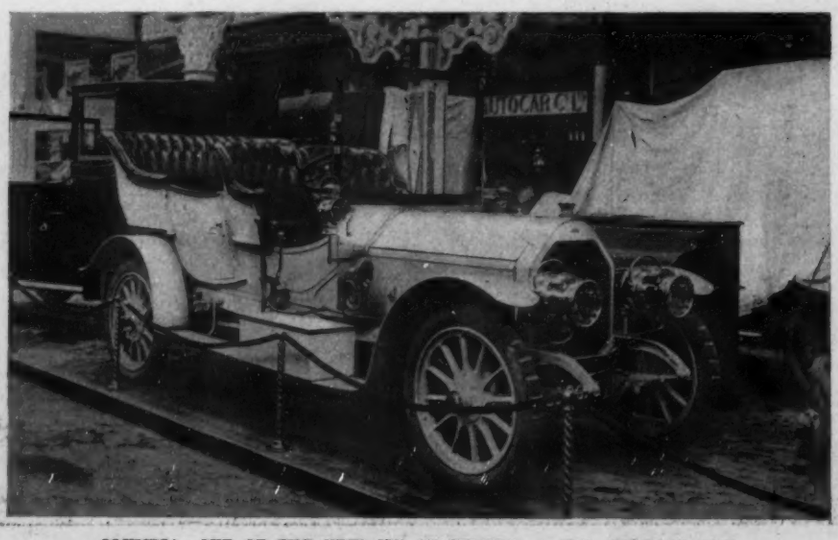
A TAKING OLYMPIA TIRE EXHIBIT.

FRENCH MILITARY AUTO CONTEST.

PARIS, Nov. 20.—Organized by the Automobile Club of France, under the patronage of the Minister of War and with several officers of the headquarters staff as members of the committee, the military wagon competition united twenty-one starters, all French. Two years ago a similar competition was proposed, but had to be abandoned on account of lack of entries. In July, 1905, a successful commercial vehicle competition was held by the A. C. F., closely followed by members of the army staff, and a similar demonstration on a rather smaller scale took place last June. This year's army maneuvers saw a large increase in the number of automobiles employed, not merely for taking staff officers from point to point, but in transporting baggage, food and water to spots reached with difficulty by horse vehicles.

Within a few weeks of the Paris Salon, and at a time when every manufacturer is busy on his next season's models, it is significant of the interest now displayed in commercial vehicles that as many as twenty-one should be gotten together on a few weeks' notice. Although several of them are veterans, having figured in previous competitions and done good work at the maneuvers, at least half are entirely new models. Among these latter are three Darracq-Serpollet steamers, built in the new Darracq factory at Suresnes. Mr. Serpollet, who has long been recognized as France's most famous steam automobile constructor, has united with M. Darracq, formed a limited liability company, and is now turning out big series of steam chassis from the famous Suresnes works. De Dion Bouton is represented by two of their well-known heavy wagons; Mors had a powerful chassis fitted with a special body for carrying milk and dairy produce without fear of deterioration. The D'Espine, Archard & Cie.'s vehicle was fitted with huge water tanks, and had given proof of its value in the recent maneuvers. Peugeot was alone among the lighter army service wagons, the remaining competitors, each carrying from five to seven tons, representing Berliet, Cohendet & Cie., Turgan, Aries, Lacoste & Battmann, Janvier, Orion, and Delaugère-Clayette & Cie.

Starting from the Tuileries Gardens, Paris, yesterday morning, the wagons will run down to Marseilles by daily stages of fifty miles, and return to Paris on December 5, together with the competitors in the Salon models pleasure vehicle competition, who leave the capital for a run over almost the same ground in a few days' time. By fixing the return of the two competitors for the same day, increased attention on the part of the public is assured. On reaching home both heavy wagons and light cars will take up the positions reserved for them in the Salon opening, on December 7. Bad weather has prevailed for some time, and neither the wagons, the drivers, nor the accompanying army officers are likely to have an easy time on their one thousand miles run.



OLYMPIA: ONE OF THE NEW SIX CYLINDERS: 35-H.P. ORLEANS CAR.

A. C. F. Objects to Proposed Auto Tax.

The French Government having proposed a tax on foreign automobiles entering France for a tour, the A. C. F. has passed a resolution protesting vigorously. A similar tax exists in Germany, much to the annoyance of touring autoists.

Lancia's Move.

It has been frequently reported that Lancia intended erecting a factory for a machine of his own design. The news is correct, Signor Lancia having left the Fiat firm, and, in partnership with Signor Fogolino, having taken the old Itala factory in the Via Petrarca, Milan, where a 14-horsepower voiturette will be constructed in large series and sold at a low price. An agency has already been established in Paris.

LETTERS INTERESTING AND INSTRUCTIVE

Compression Space and Compression Pressure.

Editor THE AUTOMOBILE:

[490.]—Will you please tell me in "The Automobile," under the heading "Letters Interesting and Instructive," how to figure compression, and oblige? ROBERT MILLER.

Sabinal, Tex.

Every engineer has a different method of figuring compression, and since they all cannot be right it is hopeless to attempt a definite answer to your question. Though apparently simple, the laws concerned in the determination of compression are obscure and numerous, and work together in relations that are far from being fully understood. There is not only the reduction of volume to increase the pressure; there is also the heat of compression to expand the gases. And added to these are various circumstances peculiar to the different types of present cycles. With a four-cycle engine the compression cannot be safely figured upon the full cylinder volume, because "wire-drawing," with consequent charge attenuation, becomes an important factor at high speeds, especially with small valve openings, and reduces the charge volume materially. With throttling a similar effect is produced, while the exhaust gases remaining in the clearance, at a temperature differing variously from that of the atmosphere, have an effect of unknown magnitude. In a two-cycle cylinder the exhaust gases are forced out by the incoming charge, which in turn is forced in, and with different degrees of throttling there is maintained practically a constant volume of gases, widely varying, however, in the proportion of residual exhaust to fresh charge. The fresh charge is, moreover, at a fixed temperature above atmospheric, while the temperature of the exhaust gases varies in accordance with the proportions of the charge from which they have resulted. The comparative influences of different systems of water cooling and of air cooling also constitute material factors. From all of the foregoing it can be readily understood that the only sure means of determining compression under given conditions is not by theoretical figuring, but by test. Almost every designer of prominence has made series of tests on this subject, many of which have been published in the form of tables. The publication of these tables would occupy so much space that we must advise your consulting some standard work on the subject. If you wish the information for work in regard to any particular engine, we will make an effort to secure it for you at the earliest opportunity.

The Simms-Bosch System of Low-Tension Ignition.

Editor THE AUTOMOBILE:

[491.]—What is the Simms-Bosch low-tension ignition system, as used on the Mercedes and other European and American cars? I would very much like to see an explanation of its operation in an early issue of "The Automobile." DR. MAX LEHMAN.

Otsego, N. Y.

The Bosch low-tension system, as it is now called, is in many respects an ordinary magneto system, but is unique in that it has an immovable H armature, separated from the poles of the permanent field magnet by an unusually large space, within which rotates a soft-iron sleeve, so that it distorts and cuts the lines of force extending from the armature to the field. By this ingenious and altogether original expedient for varying the magnetic effect, surges of alternating current are induced in the armature winding without the necessity for any revolving wires, sliding contacts, or commutator. The system has proved exceedingly successful, its simplicity insuring an unusual reliability, and it is responsible for much of the success of many of the best cars made. The Bosch high-tension system is much more complicated than the low-tension, and could not be described satisfactorily except in the space of a rather extended article. We expect to devote a chapter in the near future to this interesting and timely topic.

Cooling the Motor in Winter.

Editor THE AUTOMOBILE:

[492.]—I wish to inquire about the winter cooling of my automobile. One maker of gasoline engines advertises "polar ice machine oil" for winter use in his engine when used outdoors for sawing wood, etc. I have a Pope-Toledo, and wish to get some use of same this fine weather, but water cooling is not safe. This morning it was 15 degrees below zero, and if you left your engine for a few minutes in such temperature without its running 200 and 300 R.P.M. something would "bust." Will you please give me your opinion; or, if you don't approve of the oil, some good formula that has been tried and made good. J. E. RICHARD.

Perley, Minn.

For the extremely low temperatures encountered during the winter in your section of the country, the oil to which you refer should give complete satisfaction in the cooling system of your car. Oil as an anti-freezing liquid generally is objected to because of its low specific heat, but with temperature so far below zero and with copper water jackets on the cylinders, as in the case of your car, the engine should almost keep cool without any liquid in the cooling system. A calcium-chloride solution to resist very low temperatures must be so strong as to approach saturation, in which condition it may exercise a very corrosive effect on parts of the cooling system, especially if there is any zinc or galvanized iron for it to attack. Glycerin and water is better, but also freezes unless the glycerine content is very large, in which case the fluid is almost too thick to pump when cold, and works marked injury to rubber connections in the cooling system. Alcohol and water is very effective, if more alçohol than water is used, but besides being expensive it is somewhat risky, because the alcohol may evaporate out and thus insidiously raise the freezing point of the fluid. It is possible that some of our readers may be able to suggest something better than is suggested herein, or show some way of using the ordinary solutions under the severe conditions with which you have to contend. Failing in this, the oil seems the conservative thing to use, though even it may destroy rubber connections.

Directions for Valve-Setting.

Editor THE AUTOMOBILE:

[493.]—Will you publish in your next issue directions for setting valves on 4 x 4 double-opposed engine of the Brennan make, and oblige, ANTHONY BELL.

Columbus, Miss.

While we are perfectly willing to give you the best information we possess on the question of valve setting, we nevertheless believe that it always is best in cases of this sort to seek information directly from the manufacturers, who invariably recommend certain definite provisions, which if deviated from are likely to make a marked difference in running the engine. With an engine of the type you refer to, it seems to be the consensus of opinion among the best informed engineers that the exhaust valve should commence to open when about seven-eighths of the working stroke is completed. This would mean its complete opening, with an average cam contour, slightly before the dead center is reached. The closing of the exhaust valve, under the same conditions, will be completed at about five degrees past the upper dead center, its commencement varying with the cam contour, which differs considerably in the practice of different manufacturers. The inlet valve will commence to open as soon as the exhaust valve is closed, and will reach its full lift very promptly thereafter, because the lift is usually small and the slant of the camface rather abrupt. Closing will occur at about ten degrees after dead center, if average practice be taken. The foregoing applies chiefly to low and medium speed-engines. With higher speeds, the exhaust valve may open when only five-sixths of the power stroke is

completed and remain open until as much as fifteen degrees after upper dead center. The inlet valve will, of course, open after the exhaust valve is closed, and because of the higher speed may remain open until as much as twenty degrees after the lower dead center. Contrary to the theories on which the practice so far stated is established, there is one school of designers who, while not differing very much from current usage regarding opening times of exhaust and inlet valves, believe in closing the exhaust practically on upper dead center and the inlet on lower dead center. For the further information of our readers, we will be pleased to publish opinions from manufacturers and designers, or others who may have something to say on this interesting subject.

Air Cooling and Ignition Current.

Editor THE AUTOMOBILE:

[494.]—Is it a fact that air cooling is harder on the batteries of an ignition system than water cooling? I have an air-cooled car that uses much more current than a water-cooled car that I previously had, with the same number of cylinders and a similar ignition system, and despite trials of every possible adjustment, it certainly uses more current than the other car. Any enlightenment on this subject will be appreciated.

Whitewater, Wis. HERBERT PETERSON.

We know of no reason why water cooling or air cooling should make any difference in the quantity of current required with a jump-spark ignition system. Probably the difference you note is due to a difference in the duration of commutator contact in the case of the two cars. Does any one else know of a similar case?

AGAIN THE QUESTION OF COMPRESSION.

Editor THE AUTOMOBILE:

[495.]—In your issue of November 22, Carl Wilmerding, of Ormond, Fla., asks the effective power of explosions in gasoline engine cylinders of same size bore where the compression is 65, 150, and 250 pounds when ignition takes place. According to my way of computing, force in a gasoline engine cylinder, when the explosion was at its best, would be 276, 637, and 1,062 pounds respectively. In the first place, the greater part of the force would be exerted during the first part of the working stroke, while in the cases of the higher compression the exertion would follow the working stroke and not all be spent and there would be a loss of energy in the exhaust. So, from that standpoint, the former would be the more economical compression to use, and in the latest from a well known automobile manufacturer he states that he has dropped the compression in the cylinders back to 60 pounds, stating that at that the car does better all round work.

While, in the latter case, the energy following the length of the working stroke would make it appear to an advantage, on the other hand we must consider how much stored up power it would take to produce that high compression. There seems to be a medium which time and experience has settled upon which I find starts at about 35 pounds in a slow farm engine and up to 70 or more pounds in the high speed engines. All this has been treated as an every day occurrence, and I very much doubt its practicability, for the best of authorities consider the 100 pounds compression bordering on the danger line of premature ignition, and it has not been considered advisable to use such high compression. I stand ready for correction. L. C. GREENE.

West Branch, Ia.

SPEED INDICATOR DRIVE AND SLIPPAGE.

Editor THE AUTOMOBILE:

[496.]—It seems to me that hardly enough attention is paid, in your editorial of November 8, on the attachment of speed indicators, to the difference of slippage of the front and rear wheels and the ground. In the case of the ordinary rear driven touring car, the front wheels are rotated by the friction of the ground on the tread of the tire. The rotation of these wheels is hindered merely by the friction of the bearings which is increased by the weight of the car. Provided there is sufficient contact between the ground and the tire of the wheel, there will be no slipping except that which is caused by the displacement of the road surface by the elastic of the rubber tire. The wheels may, however, as when meeting obstructions, present a very small surface to the ground, or even leave it entirely. In this case, although the slip will possibly be greater it still amounts to little, as the momentum received tends to keep it revolving at a constant speed.

As the slipping in the first case tends to accelerate the speed of the wheel and in the second case to retard it, they act to a certain extent against each other. So it seems that the total slipping of the front wheels is small, and may be fairly accurately determined by trial. In the case of the rear wheels, the power being applied to them causes different results. The slippage at the rear wheels is greater at all times than at the front wheels, as the friction between these wheels and the ground has to transmit all the power delivered by the engine to the rear tires. This slippage might be calculated if it were fairly constant. However, it varies greatly, increasing with the speed, varying widely with the road surface, and also with the weight and the distribution of the load in the car. Also, on meeting obstructions which raise the wheels from the ground, the tendency is for the wheels to revolve at a high rate of speed until they again touch the ground, when they slip excessively before resuming their normal traction.

In regard to the suggestion to drive the indicator from a transmission or countershaft on a double chain drive car, it might prove a temptation to a demonstrator to change front sprockets, as the smaller they were the more hills could be taken and still the speed would seem to be increased on the level. It would save lots of talk to have a speed indicator tell these facts (?).

On the whole, it seems that for the sake of accuracy the front wheel must be used and improvement directed toward the transmitting shaft. Possibly an arrangement of the two sets of bevel gears near the wheel could be used to advantage.

Alameda, Cal. A. G. BROOKE RIDLEY.

WASHINGTON STATE'S GOOD ROADS AGITATION.

SEATTLE, WASH., Dec. 2.—A road skirting Puget Sound, from Blaine at the Canadian boundary to Olympia, is suggested by Halbert P. Gillette, of Bellingham, which basks in the shade of the snow-capped Mount Baker. Mr. Gillette, an experienced road builder, recently said:

"I am glad to note that Puget Sound is awakening to an appreciation of the fact that it has a great asset in its summer climate. But in order to make this asset marketable something must be done to advertise it if necessary. This State could not possibly invest money more profitably next year than in building a good road the full length of Puget Sound. Such a road would command a view of the finest inland sea in the world. I know of no country more charming than this Puget Sound in summer. Its thousand isles will some day be dotted with summer residences and great hotels. Its mountains will be the Adirondacks of the Pacific."

Automobile stage lines appear destined to play an important part in transportation of this State. Because of the rapid growth of the State it is well-nigh impossible for the railroads to keep pace. Arrangements have already been made for installing a line between Chehalis and Centrailia in Lewis County, and this will prove a great boon to commercial travelers. It has also been announced that men are interested in the proposition to establish a good road so that automobiles may reach Lake Cushman in the Olympic Mountains, the prime purpose to use it for an auto stage line during the tourist season. It is quite possible that a car will next summer be used in conveying tourists from Ashford to Longmire Springs, which is near the snows of Mount Tacoma-Rainier.

MR. FRANKLIN ARGUES FOR LIGHT CARS.

H. H. Franklin, the Syracuse, N. Y., manufacturer, is quoted as follows: "The automobile business is yet young, and while it will have its ups and downs, its future on the whole is bright. The American automobile as a type is heavy; the user has discovered that great weight is not only useless and expensive, but is also dangerous to handle on the roads of this country, and he is now demanding lightweight cars. Generally speaking, manufacturers are not prepared to meet this demand. They are equipped to make the heavy type of car; a change means a revolution for them—a revolution in their methods and in their construction; a complete turning over of every theory they have advanced in favor of automobiles like the Franklin, which will be light, flexible, finely designed, and economical in fuel and tire expense. These cars must also be built with a view to long service, and for those who develop their cars along this line success is certain."

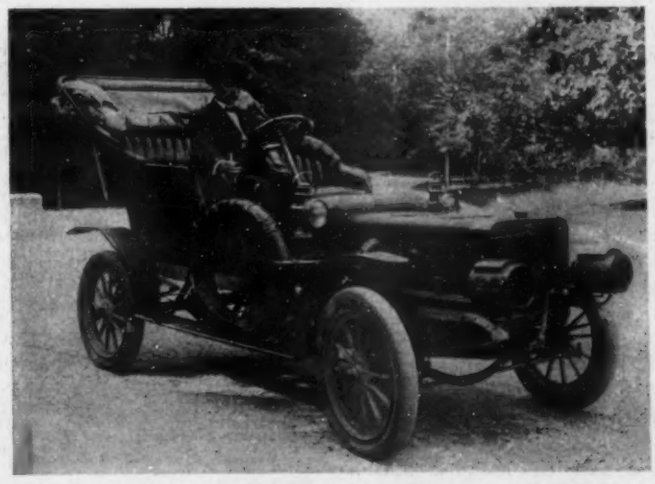
WINTERTIME AFFAIRS OF THE AUTO CLUBS

First Meeting of the New A. C. A. Board.

NEW YORK CITY, Dec. 3.—Trailing clouds of evil-smelling smoke, careless driving around corners, unnecessary clamor with the signal horn, and the use of blinding, dazzling searchlights in city streets by automobilists were put on the list of things to be suppressed by the new board of directors of the Automobile Club of America at its first meeting the other day at the clubrooms on Fifth avenue. President Colgate Hoyt occupied the chair, the others present being Winthrop E. Scarritt, Dave Hennen Morris, Gen. George Moore Smith, A. R. Shattuck, John E. Borne, Dr. S. S. Wheeler, and Melville D. Chapman. Mr. Scarritt was asked to outline a report, dealing with these evils and their suppression, to be presented at the December meeting.

It was decided to appoint an executive committee to have the managemnet of the new clubhouse, the committee to assume the duties of the present House Committee in addition to many others. The new house will be moved into January 1, when the club offices will be established there; the garage, though practically finished, will not be complete in all its details until somewhat later, and will not be thrown open for use until about the end of January.

It was decided to instruct the club's delegates in Paris to vote with the foreign clubs in regard to raising the boycott which automobile clubs have declared against Switzerland as the result of the extremely drastic laws in force in Switzerland with regard to the use of automobiles. The subject will come up for discussion at the international conference in Paris on December 15. The Swiss Club has circularized the boycotting clubs asking that the boycott be raised because of the harm done to automobiling in that country.



PRESIDENT B. H. ONKEN, OF THE PEORIA (ILL.) AUTOMOBILE CLUB, IN HIS GLIDE CAR.

Managing Committee for the Ocean Motor Boat Race Named.

NEW YORK, Dec. 3.—At a meeting of the board of governors of the Motor Boat Club of America held last week, a committee consisting of E. A. Stevens, Jr., M. M. Whittaker and John D. Roach was appointed to take charge of the motor boat race from New York to Bermuda next June. This committee will arrange the conditions of the contest and act as a determining board on the fitness of the boats for the service proposed. Thomas Fielding Day, the official representative of the Royal Bermuda Yacht Club, which acts in conjunction with the Motor Boat Club as sponsors for the race, will attend all meetings of the committee.

New York Motor Club Entertains Show Visitors.

NEW YORK, Dec. 2.—At its new clubrooms in Reisenweber's, Seventh avenue and Fifty-eighth street, the New York Motor Club, Sunday night, entertained out-of-town tradesmen in town for the Grand Central Palace show. After President W. J. P. Moore had welcomed the visitors, A. R. Pardington, second vice-president and general manager of the Long Island Motor Parkway, explained how this first automobile road in America will be constructed. Alfred Reeves, general manager of the American Motor Car Manufacturers' Association, was another speaker. A vaudeville program and supper followed.

Active Good Roads Campaign Commenced by Clevelanders.

CLEVELAND, Dec. 3.—A deep impression was made upon Cleveland automobile enthusiasts by the address of Harold Parker, member of the Massachusetts State Highway Commission, before the Cleveland Automobile Club last week. At the invitation of Secretary Goddard, of the club, himself a former good roads worker in Massachusetts, Mr. Parker came to Cleveland to tell about the work which has given his State the finest highways in the country. Before he left Mr. Parker outlined to some extent a plan of action which the local automobilists will attempt to carry out, and a petition will be circulated in this section asking the Governor for the appointment of a State highway commission.

At a meeting of the board of trustees of the Cleveland Automobile Club held Saturday, the sum of $500 was appropriated for the purpose of defraying the expenses of making preliminary surveys, preparing plans and specifications toward equipping a sample stretch of ideal automobile road somewhere within the limits of Cuyahoga county. This amount will be for immediate use and a committee will be appointed for the purpose of securing subscriptions among automobilists and good roads enthusiasts in general to carry out the plan. A committee has been appointed to select one of the numerous stretches of highway leading from the city for the contemplated improvement, and when the work is completed it is intended that it will serve as a model of what can be done under the well-directed energies of the automobilists of the Buckeye State. Work on the construction of the road will start in the spring.

The club committee will also act in conjunction with the Ohio Good Roads Association and will endeavor to co-operate, as well, with the State Grange and such other organizations of farmers as are interested in good roads.

Some Features of Jamestown Exposition Sports Program.

NORFOLK, VA., Dec. 1.—It is doubtful if a program of sports, in its diversity and greatness, has ever equaled that which has been arranged for the Jamestown Exposition, to be held on the shores of Hampton Roads, from April to November, 1907. One of the aquatic events that will be of unusual interest is the motor boat carnival. This will consist of races and speed contests by some of the swiftest motor boats ever constructed and will be brought to a close by a grand illuminated carnival at night. This illuminated carnival will be like a Mardi-Gras on the water, and will be one of the spectacular features of the Exposition. Superstructures will be built over the motor boats to represent various mythical and historical persons and events. Pocahontas, Captain John Smith, scenes from Fairyland, and the like, will be portrayed in brilliant and gorgeous lights. The course selected by the motor boat carnival committee for these contests is a triangular fourteen-mile run, in full view of the Exposition grounds. Anson B. Cole, of New York, is president of the carnival committee, and Hugh S. Gambel is secretary. The other members are prominent motor boat manufacturers and they are already planning to have the finest exhibit of this kind of craft that has ever been shown.

The aeronautical work at the Exposition will be international in

character. It has the full indorsement of the War Department and of eminent scientists all over the world. Dr. Alexander Graham Bell is president of the general committee and Albert F. Zalm is secretary of the Congress. Among the other members of the committee is Lieut. Frank Lahm, who won the international balloon race for the Bennett Cup. Augustus Post, of New York, is chairman of the executive committee and a warm supporter of the aeronautic events of the Exposition.

Louisiana Autoists Incorporate and Outline Plans.

NEW ORLEANS, LA., Dec. 1.—The Motor League of Louisiana is now permanently organized under the State laws, it having been incorporated with the following board of officers: President, Samuel W. Wels; vice-presidents, P. M. Milner and Jules Godchaux; secretary, Albert J. Mayer; treasurer, J. M. Sherrouse; board of governors, the above-mentioned officers and Samuel Stone, Jr., J. M. Burguieres, C. C. Hartwell, Dr. J. M. Magruder, T. R. Falvey, Otto T. Maier and L. K. Nicholson. President Wels has clearly set forth the objects of the league in a recent address to the automobilists of Louisiana: "It is to the interest of every individual owing an automobile to join this association, as it is in no sense of the word a social organization, and its objects and purposes are worthy of support and encouragement. It hopes to be the means of causing the improvement of the main roads throughout the State, and can and will do much towards the improvement of our city thoroughfares. Dangerous crossings and impassable conditions in certain streets continuously used will be reported to the association, and they will immediately lay the matter before the proper authorities. There are numerous driveways in the city which, with a little attention, can be made very attractive for vehicles of every kind. Intelligent work on our river roads can make them good highways for longer trips. One of the particular objects of the association will be to bring it into favor with the public at large, and this can only be accomplished by having the most stringent regulations within the organization itself."

The league has issued personal cards of membership and it will furnish the police department with its list of members and notify them of the names of any members expelled from its ranks. In these particulars the league hopes to accomplish a great deal of good. Later on, when it has been firmly established in the public confidence, an ordinance will be prepared for licensing chauffeurs and the drivers of cars, securing the proper registry of machines and eliminating objectionable and useless speed limitations, but providing a serious and large fine for the reckless use of an auto.

Arrangements are now being made for permanent clubrooms, and it is proposed to hold a race meet in the spring and an elaborate program is now in way of preparation for that event.

Chicago Motor Club Planning Energetic Campaign.

CHICAGO, Dec. 3.—Activity seems to be the keynote of the recently organized Chicago Motor Club. A number of projects for the improvement of local and general conditions are on the tapis, and last week the club appropriated $100 for the signboard committee to commence work with. Another appropriation made at the same meeting was $500 for the legislative committee, which is planning an active campaign for more reasonable legislation at the coming session of the State legislature. At the present moment the club is engaged in sending out monthly to every automobile owner in Chicago a publication on pertinent automobile topics and setting forth the advantages of affiliation with the club.

Quaker City Motor Club Looking for New Quarters.

PHILADELPHIA, PA., Dec. 3.—Negotiations are in progress for the leasing of the old Elks' building, on Arch street, for a club house for the Quaker City Motor Club. Action will be taken at the next meeting of the club during the present week. At the present time the club occupies quarters in parlor H of the New Bingham Hotel.

LONG ISLAND MOTOR PARKWAY INCORPORATED.

ALBANY, Dec. 3.—The Long Island Motor Parkway, Inc., was incorporated here to-day with a capital of $2,000,000. The company will purchase real estate and will establish an automobile course. The principal office will be at Mineola, Nassau county. The directors are: August Belmont, William K. Vanderbilt, Jr., John Jacob Astor, Clarence H. Mackay, H. Payne Whitney, Colgate Hoyt, Levi C. Weir, Frederick C. Bourne, Dave Hennen Morris, August Heckscher, W. G. McAdoo, C. T. Barney, H. B. Hollins, Mortimer Schiff, Anton G. Hodenpyle, A. R. Pardington, Jefferson De Mont Thompson, Howard K. Burras, Dean Alford, E. Rand Hollander, H. B. Anderson, New York City; E. R. Thomas, Buffalo; S. T. Davis, Jr., Bridgeport, Conn.; John Farson, Chicago; Ralph Peters, Long Island City; J. Rudolph Mollenhauer, Brooklyn.

THE AUTOMOBILE CALENDAR.

AMERICAN.

Shows.

Dec. 1-8.....—Seventh Annual Automobile Show of the Automobile Club of America, Grand Central Palace, New York City, under the patronage of the American Motor Car Manufacturers' Association.
Jan. 12-19.....—Annual Automobile Show of the Association of Licensed Automobile Manufacturers, Madison Square Garden, New York City.
Jan. 21-28.....—Los Angeles, Cal., Morley's Rink, First Automobile Show of the Automobile Dealers' Association of Southern California.
Feb. 2-9.....—Chicago Automobile Show, Coliseum and First Regiment Armory. S. A. Miles, manager, 7 E. 42d Street, New York City.
Feb. 11-16.....—Detroit, Mich., Sixth Annual Automobile Show, Light Guard Armory, Tri-State Automobile and Sporting Goods Association. E. E. McMasters, manager.
Feb. 18-23.....—Fifth Annual Automobile Show, Buffalo, Convention Hall. D. H. Lewis, manager, Teck Building, Buffalo.
March 9-16.....—Boston Automobile Show, Mechanics Hall and Horticultural Hall, Boston, Automobile Dealers' Association. Chester I. Campbell, manager, 5 Park Square, Boston.
April 6-13.....—Montreal, Canada, Second International Automobile and Sportsman's Exhibition. R. M. Jaffray, manager, 309 W. Notre Dame Street.
April 8-13.....—Pittsburg, Pa., First Annual Show of the Pittsburg Automobile Dealers' Association, Duquesne Garden.

Race Meets and Hill Climbs.

Jan. 22-26.....—Ormond-Daytona (Florida) International Race Meet, Florida East Coast Automobile Association.

Motor Boat Races.

Jan. 29-Feb. 1..—Palm Beach, Fla., Annual Races of the Palm Beach Power Boat Association.
June 8.....—670-Mile Ocean Motor Boat Race, New York to Bermuda. Motor Boat Club of America and Royal Bermuda Yacht Club.
Sept. 2-6.....—Jamestown (Va.) Exposition, Motor Boat Races.

FOREIGN.

Shows.

Dec. 7-23.....—Paris, Ninth Annual Salon d'Automobiles, Grand Palais.
Dec. 15.....—Calcutta, India, Exhibition of Automobiles, etc., Automobile Association of Bengal.
Jan. 5-12.....—Dublin Motor Show, Irish Automobile Club.
Jan. 18-26.....Birmingham (Eng.) Automobile Show, Bingley Hall.
Jan. 25-Feb. 2..—Liverpool Motor Show, Tournament Hall.
Feb. 1-9.....—London, Crystal Palace Motor Show.
March 7-16.....—London, Olympia Commercial Vehicle and Motor Boat Show.
April 6-13.....—London, Agricultural Hall Motor Show.

Reliability Runs, Race Meets, Hill Climbs, Etc.

April 21.....—Targa Florio Tour (Sicily), Auto Club of Milan.
May 29 June 1..—Irish Automobile Club Reliability Trials.
June 24-29.....—Scottish Reliability Trial, Scottish Automobile Club.

PRIVATE GARAGE ERECTED ON THE ESTATE OF FREDERICK TOWNSEND, AT SYCAMORE, ILL.

THE GARAGE LIST IS RAPIDLY EXPANDING

Private Garages of Artistic Beauty in Illinois.

SYCAMORE, ILL., Nov. 25.—Automobile owners in the Middle West are vieing with each other in the architectural beauty of their automobile houses, and within the past year some private garages have been erected at great cost. They are to be seen in Aurora, Joliet, and other of the more prosperous cities of the counties near Chicago. Frederick Townsend, a banker of this city, has completed a shelter for his Winton. The structure is built of "nigger-heads" picked from the meadows and fields of Illinois lands, and is large enough for the car to turn around inside the main structure. Outside across the approach is an ornamental gateway. Building and archway are covered with red tile. Inside the house is a complete workshop and a capacious gasoline tank conveniently located. The cost was about $2,000.

Another Large Garage for Springfield, Mass.

The E. R. Clark Automobile Company, of Springfield, Mass., has secured a lease of the lower floor and basement of the new Nansen building, on Hillman street, that city, erected for the Eastern States Refrigerating Company, and will fit up one of the largest garages and salesrooms in Western Massachusetts. The floors are 120x60 feet in dimensions, and an elevator will be installed to connect them. The ground floor of the building will be used as a garage and salesroom, and the offices of the company will be placed there. In the basement will be a large repair shop fitted with all the necessary machinery for automobile work. Machines will also be stored on this floor.

Lake Placid Prepares to Receive the Auto Tourist.

A fine new garage has been built at Lake Placid, N. Y., by the Lake Placid Company, to accommodate 150 cars. There are nine entrances, two pits, baths for chauffeurs, hot and cold water on every floor, and all modern conveniences for both car and man. An innovation consists of providing bedrooms for chauffeurs.

Three New Garages to Be Built in Cleveland.

Three garages will be established in Cleveland this winter by the Colonial Automobile Company, of which J. M. Gee is the head. One will be down town, one on the east, and the third on the west side of the city.

Manager Kiser Saved His Wintons.

Earl Kiser, manager of the Winton agency in Beatty street, East End, Pittsburg, Pa., who possesses only half the natural number of legs, owing to the unfortunate accident on the track at Cleveland last year, which deprived him of one of those useful members, proved himself a man of nerve, notwithstanding his loss, when, during a fire in the garage last week, he personally brought out no less than eight high-priced automobiles and saved them from destruction. Time after time he entered the burning garage and steered a car out through the flames each trip. In this way he saved all the 1906 Wintons in the building; they were taken to the Standard Automobile Company's garage across the street, where Mr. Kiser will establish the Winton headquarters until his own garage has been put into usable condition.

Another Mission Architecture Garage in the West.

Col. Albert A. Pope has arranged to build a large garage in Pueblo, Colo., on the corner of West Fourth and Court streets, at a cost of about $20,000. The building will have a frontage of 120 feet and will extend back 120 feet from the street; the architecture will be of the mission style, and the garage as a whole will compare favorably with the large establishments in the East. George D. Meston, Col. Pope's local representative, will direct the work.

NOTES OF THE GARAGES.

Manley Brothers, of Brattleboro, Vt., agents for the Ford, Ramblers, and Stoddard-Dayton cars, are enlarging their garage to accommodate the rapidly increasing business.

Oscar Bergstrom, of Minneapolis, Minn., is having built a garage at 310 Ninth street south; the building will measure 50x100 feet and will be ready for occupancy about the first of the new year.

A new concern has been incorporated in Elkhart, Ind., under the title of the Elkhart Garage Company, to do a general garage business in that place. The capital stock is $10,000. The directors are Charles G. Conn, William J. Gronert, John S. Landon, and Mary E. Landon.

THE AUTOMOBILE

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Impressions to Be Secured at the Show.

The first impression secured from a view of the Seventh Annual Show of the Automobile Club of America is one of the magnitude of the American industry. Altogether regardless of any pre-eminence that Europe may have held in the past or may claim in the present, in the tremendous industry founded upon the mechanically-propelled road vehicle, the fact is too obvious to permit dispute that in the United States there is a greater market for automobiles than all the rest of the world besides.

The past season is notable for the number of new concerns that have entered the field—concerns that are very far from being of the speculative, unsubstantial sort that cropped up over night a few years ago. They are rather of established reputation in other lines, amply financed, but lately brought to a recognition of the momentous fact that the automobile field is one for the exercise of engineering talent and manufacturing resources absolutely without counterpart in the whole world of business.

With its 80,000,000 people, the United States has over one-twentieth of the population of the globe, and, if the automobile buying populations be considered, fully one-half or one-third.

Indeed, in a country that for the last twenty years has produced and disposed of an average of over a million and a half horse-drawn vehicles a year, it is difficult to set bounds to the magnitude of an industry that has for its goal nothing short of the practical extinction of the horse.

That the greatness of the field is fully appreciated by those who are catering to it or planning to cater to it, the annual shows say the final word, with each expression couched in terms more positive than could be used in the one which preceded. "Automobiles for to-day, to-morrow, and the years to come," to paraphrase the advertising slogan of one enterprising manufacturer, are the significance of the show now open. The industry is, beyond all dispute or question, founded firmly on a sound and permanent basis.

And in the variety of exhibits and the crowds that throng the stands there are presaged future triumphs almost overshadowing present achievements. It must be a mind unimaginative indeed that can view car after car, development upon development, and a growth so tremendous that it seems to be almost in a race with itself, without grasping at least some small part of the glowing vision that inspired the few pioneers and continues to inspire their many followers with the zeal of crusaders.

An impending era of State and interstate good roads, extending from the most congested centers of population to the remotest solitudes, and providing inexpensive and rapid means of travel for the individual, in his own comfortable conveyance, is in the foreground of the picture. Back of this is the humanitarian relegation of the horse—longest suffering slave of mankind—to the menageries and the museums. Beyond these are changes for the better in the whole scheme of human relations—to result from widened environments, more extended knowledge of people and nature, and the dissolving of metropolitan congestions—in ways that will be of interest to everyone in the future as they are to the social reformer to-day.

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A Texas News Item That Tells Its Own Story.

Scarcely needing any editorial comment whatever, for it practically tells its own story, is the following news item sent in by our Fort Worth, Texas, correspondent. It herewith follows:

"Far out in West Texas, where land to the extent of 5,000 acres may be obtained for the asking, the citizens of a small town, Pecos City, have raised $15,000 for the establishment of an automobile stage line to bring the cowboys and townspeople of the neighboring little villages into their city for trade purposes. The Pecos country is as sparsely settled as any part of the State of Texas, ranches of tremendous acreage and small population holding sway throughout. A 35-horsepower car has been ordered and is already on the way to Pecos City to make round trips to Panama, Grandfalls and Fort Stockton. More cars will set at work later on. The subscription list was circulated, and within twenty-four hours the entire amount of $15,000 was subscribed. The new service will run through a district where roads are unknown, cross cuts being taken over the fields."

The news from Texas only accentuates the widespread necessity for the automobile that is going to be availed of in increasing fold in the next few years. The optimistic autoist, thoroughly convinced of the great future of the industry, will add the item from the Lone Star State to his many arguments.

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Necessity Apparent for a Strong Organization.

Of the necessity for a strong national organization, with effective bodies in every State and a club in every city, no automobilist has any doubt, for there is immense good that can be accomplished through a well-constructed army of automobiling; but the bulk of the work must be done, first by the club, where possible, and then by the State body, which yields a more powerful influence than can be exerted by a national organization striving at long range. Therefore the constitution of the A. A. A. will shortly be subjected to some radical changes which will place the machinery more in the control of the State bodies.

It is the duty of every automobilist to belong to his local club, it is the duty of the club to belong to the State body, and it is the duty of the State body to be a part of the national association. United, we can accomplish all things that we should accomplish; divided, our progress will be slow and difficult, beset with annoyances and hampered in our enjoyment of the greatest pastime that has ever been given to mankind.

THE NEWS FROM PARIS.

PARIS, Nov. 24.—Unable to make its annual automobile race a financial success, and no longer willing to incur the heavy loss of the two preceding years, the committee of the Automobile Club of France has finally decided, on the recommendation of the Sporting Commission, to farm out its 1907 Grand Prix. Victor Breyer has already intimated his willingness to provide all that is necessary in the shape of a specially prepared and guarded course, grandstands, weighing-in sheds, free of all expense to the club, on the condition that he be given the entrance fees and all receipts from grandstands, advertising, etc. Now that farming out is officially decided upon, many more candidates will certainly send in applications. A technical knowledge of automobilism is not at all necessary, and any public ball decorator or ordinary contractor could provide what is wanted. All matters closely effecting the competitors remain in the hands of the club, who will start, control, and conduct the race as heretofore, but will be relieved of all preliminary work of preparing the course, and, most important of all, of paying the piper when all is over. There was some opposition to the proposal, led by the Marquis de Dion, but after a long and serious discussion M. Rene de Knyff succeeded in winning over a majority to vote for farming out. The public does not entirely approve of the proposition, and it is pretty generally pointed out that if the eager contractors can provide as well as the club and secure a profit for themselves, the A. C. F. must have been guilty of extravagance or ill-management; if, on the other hand, the race cannot be run at a profit on its present high standard, the public will certainly be fleeced by the contractor.

At the same meeting the club committee approved of the recommendation of the Sporting Commission regarding next year's race, a forecast of which has already been given in these columns. The 1907 Grand Prix will therefore be held on a short circuit over a total distance of 497 miles, in one day, with a gasoline allowance of 52.8 gallons. There will be the same fixed tire and gasoline stations for all competitors, as this year, all work on cars must be done by driver and mechanic, and in case of necessity a reserve man may replace the original driver. The tire test will be carried out as an auxiliary of the race, on lines already indicated. Neither date nor place has yet been decided upon, though June or early July is proposed. Entries, three for each firm, close on February 1, 1907.

German Emperor's Cup Race.

Considerable interest is shown in France in the German touring competition, for the Emperor's Cup, to be held on the Taunus Circuit next June. It is a speed contest over a circuit not to exceed 500 kilometers, reserved for genuine touring machines. Limitations are a cylinder capacity of eight liters, minimum weight of 1,175 kilos (including coachwork, tires, oil, but without gasoline or water), a chassis clearing the ground by at least 15 centimeters. Wheelbase not less than three meters, vertical mud guards, distance from back of mud guard to middle of rear axle two meters, height of two seats without padding 325 millimeters, wooden wheels, dismountable rims if desired, and gasoline tank in any position.

Two persons must be carried side by side on a racing body, and all work on the machine must be done without outside aid. There will be two fixed fuel stores, with a separate stand for each competing firm.

Any firm may enter not more than three machines, at a fee of 3,000 marks per car, engagements being received at the Imperial Automobile Club, Berlin, up to December 31, 1906. The Darracq Company has already declared that it will enter a team, and the De Dion-Bouton firm will construct an eight-cylinder machine specially for the contest.

The Herkomer Cup in 1907.

The Herkomer Cup Circuit has been modified on account of numerous objections to the mountain speed contest. The speed test will thus be held on the Kerselberg road, as in 1905, and the following will be the complete circuit:

First day.—Dresden, Chemnitz, Zwiekau, Weiman, Eisenach.

Second day.—Eisenach, Meininger, Mannheim.

Third day.—Mannheim, Carlsruhe, Freudenstadt, Lindau (Lake of Constance).

Fourth day.—Lindau, Immenstadt, Kempten, Furser, Stornberg, Parc de Forstenried (kilometer race on level), Munich.

Fifth day.—Rest and exhibition at Munich.

Sixth day.—Munich-Kerselberg (mountain race), Partenkischer, Ober-Ammergau, Landsberg, Augsbourg.

Seventh day.—Augsbourg, Hombourg, or Wiesbaden.

INDIANA'S NEXT YEAR'S AUTO OUTPUT.

INDIANAPOLIS, IND., Dec. 3.—The State of Indiana, according to figures from manufacturers throughout the State, will manufacture upward of $12,000,000 worth of automobiles during the year 1907. This, it is believed, will place Indiana well at the head of the automobile industry.

An accurate estimate of the number of automobiles that will be manufactured in Indiana next season would, perhaps, be impossible, for in past years estimates made at the beginning of a season have invariably been exceeded. But it would be safe to predict that fully 7,000 cars will be turned out and that about 45 per cent. of them will be made in Indianapolis factories.

The coming season will find the Maxwell-Briscoe Motor Company beginning manufacturing operations at Newcastle, with one of the largest factories in the country; the Overland Automobile Company, of this city, re-entering the field after an absence of two seasons, and the Leader Automobile Company moving into a new factory at Knightstown. Some half a dozen or more concerns recently incorporated will begin operations for the first time, while there will be one or two "funerals."

The coming season is also of interest for another reason, as it marks the session of the Indiana Legislature, which meets but every two years. There is to be much legislation of interest to automobile people brought up.

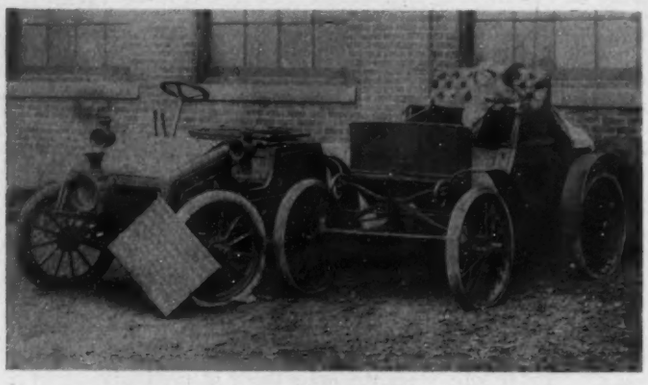
PENNSYLVANIA IN HARMONY WITH A. A. A.

A conference took place in New York City, Monday, at the Lawyers' Club, participated in by officers of the A. A. A. and the Pennsylvania Motor Federation, which at the present time is not allied with the national organization. Isaac Starr, of the Automobile Club of Philadelphia, and Robert P. Hooper, of the Automobile Club of Germantown, represented the Federation, of which Mr. Starr is the president. President John Farson and Secretary Sidney S. Gorham spoke for the A. A. A. A. R. Shattuck, of the Automobile Club of America and ex-chairman of the National Highways Committee, and A. G. Batchelder, ex-secretary of the A. A. A., were also present.

A thorough understanding between the two organizations was the result of the talk. The Pennsylvanians are particularly concerned in a uniform automobile law and are also deeply interested in highways improvement. Mr. Hooper is chairman of the National Highways Committee of the A. A. A., and with Mr. Starr has been exceedingly active in regard to the proposed Philadelphia-Pittsburg highway. Mr. Gorham, in addition to his secretarial duties, is chairman of the National Law Committee, and he has been in correspondence for some time with the Pennsylvanians, who believe that the only way to secure uniform legislation is through each State association working for a measure that will be introduced in all State legislatures and be passed with as few amendments as possible. In the near future copies of the proposed uniform law will be ready for distribution. Mr. Shattuck, who was a prominent factor in the passage of the New York State $50,000,000 roads appropriation, advised the Pennsylvanians as to the policy which he thought would gain the most substantial progress in Pennsylvania.

TWO INTERESTING RELICS OF FAMOUS RUNS.

Fame is evanescent enough in these fast-going modern times, and the marvel of yesterday is the well-nigh forgotten antiquity of to-day. This is particularly true of automobiles, and the accompanying illustration is a striking example of this fact. Both the cars shown were notable in their day. The one on the left,



"OLD PACIFIC" AND THE "FATHER OF PACKARDS"

with the placard dropping off, is Old Pacific, the identical car which in 1903 was driven across the continent by Tom Fetch and which won a gold medal in the now famous New York-Pittsburg run of the same year. The other is a really venerable machine, from an automobile point of view—in fact, it is the father of all Packards, the original Packard one-lunger built ten years ago in a corner of the electrical factory of the New York and Ohio Company, of Warren, O., by J. W. Packard. The two machines stand in an obscure corner of the Packard factory yard, keeping each other company and doubtless wondering, in a mechanical way, how much longer they will be allowed to stand and watch the changes in the cars that come after them. Tom Fetch, still with the Packard company, occasionally walks over to where the old machines stand and takes a long, retrospective look at Old Pacific.

BALLOT BOX DELIVERY BY AUTO TRUCKS.

In any class of service where time-saving is of importance the automobile can be used to advantage, and corroboration of this is constantly cropping up in the form of reports of the use of automobiles for quick service in new fields. One of the latest of these tells how eleven commercial vehicles were used in Detroit to pick up ballot boxes from the various polling places on election day and deliver them to the central counting bureau. The trucks, built by the Reliance Motor Car Company, of Detroit, not only went through the work without a hitch of any kind, but did the work in less than half the time required by horses. A police officer was placed in charge of each truck, a driver being furnished by the Reliance people. Three trucks were held in reserve for use in case of trouble with any of the others, but were not needed. Another feature of the event was that the police patrol wagons which would have been used if the motor trucks had not, was that the patrol wagons responded to no less than twenty-eight calls during the time the boxes were being collected. It is considered important that the patrol wagons should be free to attend to their legitimate work at such a time, as election night is apt to be a time of considerable wildness in the streets.

MR. FRANKLIN NOW MAJORITY STOCKHOLDER.

H. H. Franklin, who has been active manager of the H. H. Franklin Manufacturing Company, of Syracuse, N. Y., since its inception, has secured control of the corporation by acquiring most of the stock held by Alexander T. Brown and W. C. Lipe, who, aside from Mr. Franklin, were the heaviest stockholders. Mr. Brown and Mr. Lipe are increasing the size of the plant of the Brown-Lipe Gear Company; hence their action. Other purchasers of the stock were Giles H. Stilwell, John Wilkinson, and F. A. Barton, all of whom are actively engaged in the affairs of the company. H. Winfield Chapin, of the Brown-Lipe company, also sold stock in the Franklin company in order to increase his Brown-Lipe holdings.

Mr. Brown and Mr. Lipe have retained sufficient stock in the Franklin company to enable them to qualify for the offices of president and vice-president respectively, which offices they hold in addition to being directors. John Wilkinson is still the engineer, Mr. Stilwell attorney for the company, and Mr. Barton assistant manager.

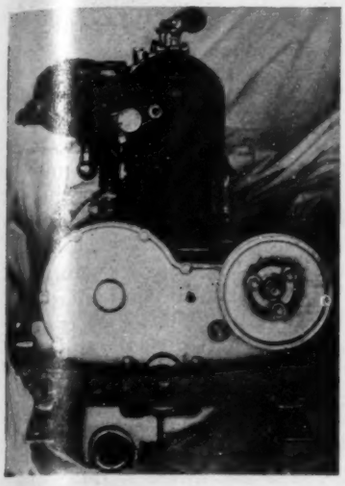
"The policy of the company remains unchanged," was Mr. Franklin's comment on the transaction. "The transfer simply means that those engaged in the active management of the company have taken over some of the stock of Mr. Brown, Mr. Lipe and Mr. Chapin. Mr. Brown will continue to be president and Mr. Lipe vice-president, and both are directors."

Previous to going into the automobile business, five years ago, Mr. Franklin manufactured castings, and this business he still carries on in addition to the automobile manufacturing. He is also treasurer of the Association of Licensed Automobile Manufacturers.

RELIANCE TRUCKS WHICH DID SERVICE FOR THE CITY OF DETROIT, DELIVERING BALLOT BOXES.

THE 40-HORSEPOWER CRAIG-TOLEDO CAR

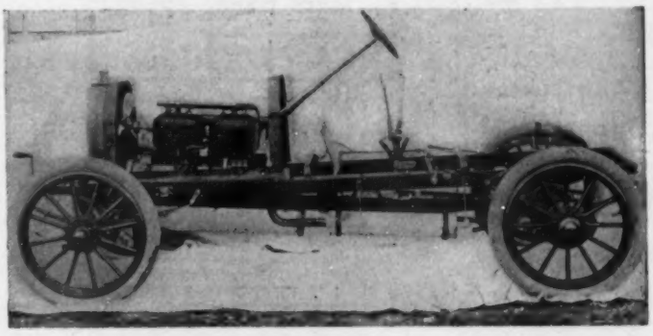
WHETHER looked at from a mechanical point or from the standpoint of the man who merely likes to ride, there are features of much interest in the new Craig-Toledo high-powered runabout built by the Craig-Toledo Motor Company, of Toledo, O. The car has a double seat for the driver and passenger with a small rear seat for the chauffeur—the popular arrangement for cars of this type—and though weighing but 2,550 pounds, has a motor rated at 40 horsepower, driving through propeller shaft and bevel gears to the live rear axle. It will be noticed, however, on looking at the illustrations, that the suspension of the motor and transmission is out of the ordinary. The whole power and transmission plant is mounted on a single long sub-frame extending from the front of the frame to the rear axle. This sub-frame forms a three-point suspension, being pivoted at its front end to the main frames of the car at each side, and at the rear end it joins the rear axle casing. The sub-frame carries at its forward end the motor and further back the multiple disk clutch and the three-speed sliding gears, these being mounted on ball-bearing shafts and controlled by a single progressive lever. The motor shaft, primary transmission shaft, and propeller shaft are all mounted in alignment, and their relative positions are rigidly maintained by the sub-frame; no universal joints are used. The sub-frame also transmits the driving stresses and the power and transmission mechanisms are unaffected by any springing or twisting of the main frames.



FRONT OF CRAIG-TOLEDO MOTOR.

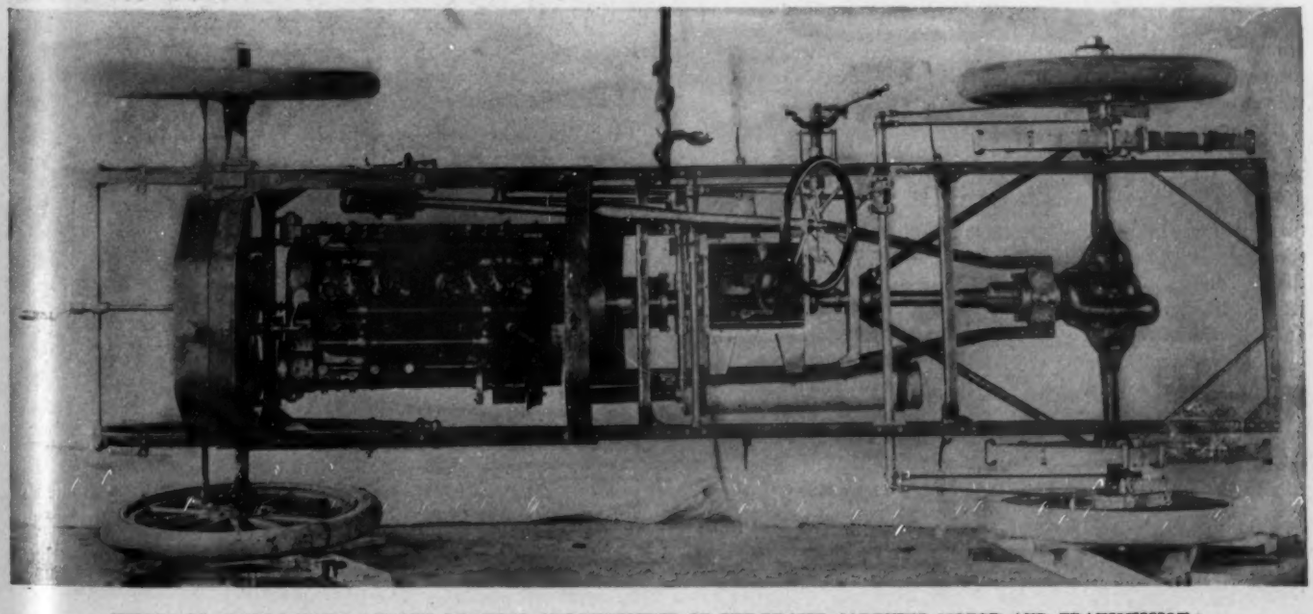
High-grade materials are used throughout the car. Chrome nickel steel is employed for the framing, the transmission gears and other important parts. The motor, with four vertical cylinders of 4 3-4 inches bore and 5 inches stroke, has its cylinders cast in pairs with integral heads and water jackets, and the valves are all on the same side—the right—and are operated by a single camshaft with integral cams. Ignition is by jump spark, with two sources of current supply, an Eisemann high-tension magneto of the oscillating type and a storage battery for emergency use, change being made by means of switch on dash.

Lubrication is by splash, the oil level in the bottom of the crankcase being maintained by a gear pump with an overflow pipe. Oil is forced first to the crankshaft bearings and thence to the oil basins, each of which has a separate overflow to the return reservoir, so that the proper level is maintained automatically. The lubricating system is entirely automatic and none of the feeds is outside of the engine. The only attention required, apart from putting in the requisite quantity of oil, is the monthly cleaning of the wire gauze strainers.



SIDE VIEW OF CRAIG-TOLEDO 40-H.P. CHASSIS.

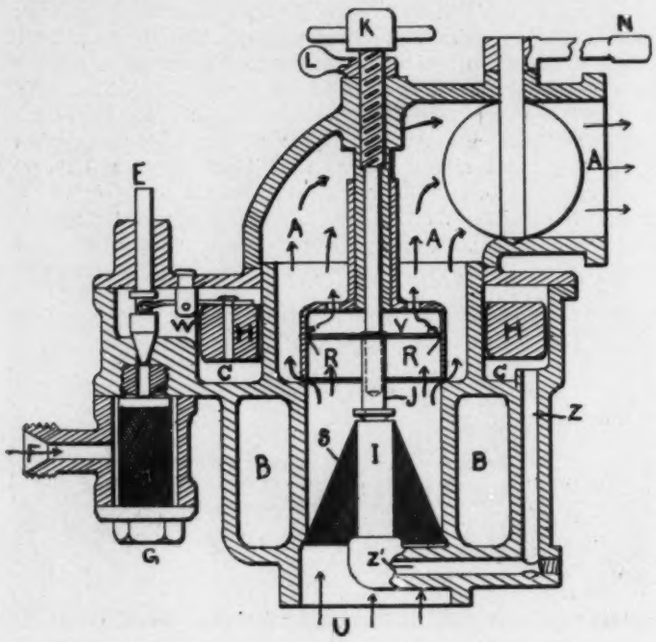
The body is of aluminum; under the front seat is the large gasoline tank and also a spacious storage compartment. Under the chauffeur's seat are two locked drawers for tools and so on. The body is mounted on the main frame, independent of the power plant. All brakes act on drums on the rear hubs. Screw and nut steering gear is fitted. Wheels are 36 inches in diameter, front and rear; the rear wheels are fitted with 4-inch tires and the front wheels with 3 1-2-inch tires. The wheelbase is 112 inches. The price is $4,000.



VIEW OF CRAIG-TOLEDO CHASSIS SHOWING ARRANGEMENT OF SUB-FRAME CARRYING MOTOR AND TRANSMISSION.

A CARBURETER FROM THE PINE TREE STATE.

The designer of the Leinau carbureter, made by the Duplex Roller Bushing Company, of Belfast, Me., after exhaustive tests that took in all the general theories on the varying flow of gasoline with open jet carbureters, came to the conclusion that the general assumption was right, but from entirely different reasons than supposed. His tests proved to his satisfaction that the suction created by the flow of air at the spraying nozzle is in direct proportion to the velocity of air flowing past the nozzle. Reasoning from this the conclusion was arrived at that in the ordinary open-jet carbureter the first suction stroke of the engine draws a certain proportion of fuel with it, but at the end of the stroke the inlet valve closes, in a measure, with a snap that stops the air flow almost instantly. Owing to its inertia, however, the heavier fuel flows a little longer, after the air has stopped, depositing itself on the walls and other interior parts, to be picked up by the next incoming charge.



SECTIONAL DIAGRAM OF THE NEW LEINAU CARBURETER.

For constant speeds this condition would, of course, give a constant mixture, and could be taken care of with little or no trouble. But at the extreme ranges of speeds which present-day internal combustion motors are called upon to take care of, some means must be provided for diluting, as this theory carries with it the obvious condition that at extremes of speed the jet of gasoline flows continuously while the air flows intermittently. From these deductions came the carbureter design here shown.

The gasoline flows in at a swivel coupling, F, which may be turned in any direction for the tank connection. The feed is then to a removable plug channel with a cleaning screen and through the needle valve, E, to the float annular chamber, C, with its ring float, H, hinged at W. The needle valve is of large area and is ground in, giving a valve that can be ground at any time by simply twirling the stem in the fingers. The gasoline leaves by the passage Z Z, which starts from a point higher than the bottom of the float chamber to prevent any sediment from having a free passage. The float chamber has no drawing off plug, as it takes no more time to loosen the side clamps, and by this method of clamping the float chamber may be quickly and thoroughly cleaned.

As the gasoline passes through the channel Z Z it is carried down and under the heater jacket B, thereby slightly warming it, thence up the spraying tube I and out of an orifice formed when the valve J is off its seat. Air enters at U, flows up through screen coned S, impinging on the check-valve disc V, thereby lifting it and allowing fuel to flow out of the spraying orifice. The flow then continues through the bell R and through the outlet in dome A. As the speed increases, or as the throttle is opened, the concentrating bell R is raised from its seat to accommodate the greater flow of gas. But when only a small amount of gas is flowing the concentrating bell R remains on its seat, thus concentrating all the gas around the valve disc V and causing it to lift. This gives the Lineau carbureter quick throttling. Throttling is accomplished by a rotary disc valve Q which is actuated by lever N. The entire carbureter is built in the company's own plant, "from foundry to shipping-room," and is constructed of high-class material on up-to-date automatic machines.

SUPPLYING MOTOR WITH EXACT OIL QUANTITY.

An expert oil refiner and automobile driver, connected with Aurora automobile oil, expresses the following opinion on proper lubrication for gasoline engines: "The writer has made exhaustive tests covering a period of six years of oil suitable for the proper lubrication of gasoline automobiles and launches, and has demonstrated that a medium fire test oil is the only thoroughly satisfactory lubricant. It was found that in the use of a medium fire test oil the excess feed which was forced to the upper part of the cylinders was entirely consumed by the flame and passed through the exhaust valves in the form of gas, leaving the plugs, intake, and exhaust valves clean and free from any deposit whatsoever. On the other hand, with the high fire test oil it was found that the excess feed forced to the upper part of the cylinders offered a resistance to the flame and baked or carbonized on the valves and fouled the plugs, resulting in loss of compression and necessitating cleaning or renewing the plugs."

COLUMBIA ELECTRIC TRANSMISSION CAR.

Many expert autoists in and around New York City have been anxious to know just what the Columbia touring car with electric transmission can specially do on hills, for which work it was particularly designed. The opportunity came to a number of them on the day of the Yale-Harvard football game, when they were taken from New York City to New Haven and back in record time. An example is given of its speed and control, combined with quiet running, in the statement that the trip from New Haven to Bridgeport was made in thirty-five minutes. The trip was part of the demonstration work that has been given the car around New York City by Bert Holcomb, who for years held the Chicago-New York record. This car is without clutches or gears, and all speed changes are made with a small control handle, four of its forward and all three reverse speeds being controlled through electrical mechanism which takes the place of the usual flywheel and gearbox. The high speed, the fifth forward, is direct from the regular four-cylinder gasoline motor.

BERT HOLCOMB IN COLUMBIA ELECTRIC TRANSMISSION CAR.

ROLL CALL OF THE GRAND CENTRAL PALACE SHOW

Abendroth & Root Mfg. Company.—E. R. Burroughs, Dr. F. E. Russell, J. McIlvrid.

Acme Motor Car Company.—Arthur A. Devlin, John W. Mears, Oliver A. Bicknel, A. E. Arnold.

Aerocar Company.—Edgar Storms, Jr., Percy Owen, Mr. Lancier, Mr. Murray and Mr. Stickles.

Ajax-Grieb Rubber Company.—Horace De Lisser, president; C. C. Tucker.

Allen & Kilduchevsky.—Arthur Allen and Paul Kilduchevsky.

Allen Auto Specialty Company.—Wm. A. Allen, W. F. Warriner.

American and British Manufacturing Company, Bridgeport, Conn.—E. B. Lausier, C. S. Gulick, R. H. Newman, W. L. Stone, L. Robson and W. C. Canlets

American Ball Bearing Company.—F. Philip Dorn.

American Electric Novelty Company, New York.—C. Hubert, P. F. Blake, W. G. Mills and A. Hollender.

American Locomotive Automobile Company.—Albert T. Otto, F. W. Cobb, W. M. Turner and D. L. Whitford.

American Metallic Wheel and Auto Company.—D. C. Baker, John Bigler.

American Motor Car Company.—V. A. Longaker, president; Fred I. Tone, manager; E. A. Sontag and W. A. Frederick, Boston agents.

American Motor Company.—C. H. Metz, W. T. Marsh, G. P. Jenkins.

American Motor Truck Company.—E. M. Bunt, C. R. Bishop, Henry C. Eddy, H. J. Babcock, Robert Hall, L. A. Saunders, J. E. Warren, Louis Anderson, Charles F. Smith.

Arc-Spark Mfg. Company.—Maitland Davies, R. E. M. Howard, Geo. Loring, Chas. Pearson.

Argus Import Company.—Jesse J. Beitler, Morris Ulrich, C. M. Hatcher, H. W. Smith.

Atwater Kent Manufacturing Company, Philadelphia.—A. A. Kent, E. D. Dunning and G. B. Lucas.

Atwood Manufacturing Company.—Geo. S. Atwater, J. H. Atwood, W. J. Atwood, James Hume, L. F. Stilwell.

Aurora Automatic Machine Company.—Wm. Ottawa.

Austin Automobile Company.—Walter Austin, E. G. Allan, Paul Holmes, Henry Kershaw, E. L. Litchfield.

Auto Cabinet Company.—Eugent A. Byrcher.

Auto Coil Company.—Arnold Lesser, John Mehan, Fred. Patterson, Frank Murphy.

B. L. M. Motor Car Company.—Sidney Breeze, Chas. Lawrence, Arthur Moulton, William Angiatta.

Badger Brass Manufacturing Company.—L. J. Keck, vice-president; W. L. Yule, secretary; C. M. Hall, W. H. Yule.

Baldwin Chain and Manufacturing Company.—W. H. Gates, treasurer; Thomas H. McQuown.

Bartholomew Company.—R. A. Whitney, G. G. Luthy, J. B. Bartholomew, A. Y. Bartholomew and John Kuple.

Berkshire Automobile Company.—E. C. Hill, New York manager; George H. Berg, New England manager; R. M. Darling and H. F. Bishop, Brooklyn managers; Floyd Knight, Pittsfield; T. Milliken, Pittsfield; F. Lape, Pittsfield; F. E. Keene, Pittsfield.

R. Bertelli & Co. (Zust).—Henry Dolbau, Marquis Soumis.

Bousquet & Co. (Bianchi).—Mons. Bousquet.

S. F. Bowser & Co.—E. M. Savercool, H. E. Anderson, Carl W. Gridley, H. W. M. Storer, C. F. Hatmaker, W. T. Hatmaker.

Brandenburgh & Co.—G. C. Brandenburgh, J. Brandenburgh, F. E. Moskovicks, P. E. Hawley.

Brown-Lipe Gear Company.—H. W. Chapin, manager; Thomas J. Wetsel, Eastern representative; L. D. Bolton, Detroit; K. Franklin Peterson, Chicago; John T. Hardy, factory salesman.

Buckeye Manufacturing Company.—B. F. Lambert, president; J. W. Lambert, secretary and treasurer; G. B. Louderback, sales manager; A. R. Lambert.

Byrne-Kingston Company, Kokomo, Ind.—George Kingston, C. T. Byrne, Ray Deal, John Grace and Marion Black.

Charron, Girardot & Voigt, New York.—Em. Voigt, Gaston Rheims, Walter McEvoy, E. Hayes and G. Bondis.

Commercial Truck Company of America.—Chas. Derg, R. C. Gregg, Russell Thayer, Jr.

Connecticut Telephone and Electric Company, Meriden, Conn.—E. C. Wilson, B. C. Rogers, C. J. Connolly, C. W. Cuno, B. F. Spitzer, M. A. Lawton, T. F. Russell, F. B. Russell, Mr. Bancroft, D. L. Herman and C. A. Madison.

Conover Motor Car Company.—E. K. Conover, president; A. B. Watson, vice-president; E. M. Squires, salesman; W. S. Montgomery, salesman; F. H. Fonderville, salesman; R. F. Watson, salesman.

Consolidated Manufacturing Company, Toledo, O.—Edward Buffum, W. J. McGuire, F. C. Cornish and John McDowell.

Continental Caoutchouc Company.—J. M. Gilbert, general manager; P. O. Eckhardt, New York; F. H. Loomis, New York; W. A. Rutz, New York; E. S. Brower, New York; R. Simonetta, New York; B. J. Collins, New York; M. Smith, New York; F. Cutsler, New York; C. G. Waldman, New York; R. M. Hemandes, New York; C. A. Gilbert, New York; J. H. Sheldon, New York; E. T. Horsey, Cleveland; F. M. Parker, Buffalo; S. Brooks, Detroit; J. L. Gibney, Philadelphia; Irving Angier, Boston; H. W. Bogen, San Francisco.

THE NEW YORK MOTOR CLUB ENTERTAINED THE OUT-OF-TOWN VISITORS SUNDAY NIGHT WITH A SMOKER AT REISENWEBER'S.

Craig-Toledo Motor Company.—W. K. Terry, A. W. Coulter, W. E. Jacoby, Frank Blair, Roy Carter.

Wm. Cramp & Sons' Ship and Engine Building Company, Philadelphia.—Richard Thompson, Cortlandt B. Cramp and John E. Maronsy.

Crawford Auto Company.—R. S. Crawford, W. W. Taxis and Joseph Troxel.

Cryder & Co., New York.—A. L. Bennett, H. Cryder and E. Costiglione.

G. H. Curtis Manufacturing Company.—L. A. Baker, Ward H. Fisher.

Daimler Manufacturing Company, Long Island City.—C. M. Bogey, J. Mattice, Henry C. Stratton, B. F. Benson and R. P. Matches.

Dayton Electric Company.—V. G. Apple, R. L. Huber, H. F. Apple, A. A. Allen, E. J. Allen, L. F. Rogs, R. V. Sutliffe.

Dayton Motor Car Company.—R. Newton, president, A. H. Whiting, vice-president, C. E. McShane, Atlantic Motor Car Company, New York; A. W. Stoddard, vice-president, R. Edwards, engineer, S. Croninger, sales manager, Dayton Motor Car Company.

Deere-Clark Motor Car Company.—C. M. Clark, H. T. Wheelock.

Delahaye and Pilain Agency.—Wm. H. MacIlroy, Mons. Couché, J. C. Taylor, M. E. A. Tucker, Robert DeBarres, Frank DeBarres.

De Luxe Motor Car Company.—F. M. Keeton, John T. Fisher, Mr. King, Mr. Baldwin, H. J. Herzog, Fred Davis and George Soules.

Detroit Auto Vehicle Company.—E. T. Ross, J. N. Willys, F. W. Weston, E. L. Kennedy.

Detroit Lubricator Company.—W. P. Wilson.

Detroit Motor Car Supply Company, Detroit.—Charles Link and Lucius E. Straw.

Diamond Chain Manufacturing Company.—W. P. Culver, C. W. Hatch.

R. E. Dietz Company.—Theodore Goetz, G. A. Allen.

Diezemann Shock Absorber Company, Hoboken, N. J.—G. Diezemann, G. W. Barbery, F. J. Dansingburg and H. Fisher.

Direct Drive Axle Company, Columbus, O.—R. V. Barto, I. H. Pleukharp, C. J. Phillips, F. E. Wells and Edward Eckert.

Dolson Automobile Company.—W. E. Dolson, D. E. Dolson, W. Hands, L. M. Disney.

Dorris Motor Car Company.—H. B. Krenning, president; G. P. Dorris, designer; J. T. Rumble, sales manager.

Dragon Auto Company, Detroit.—Henry Rawl, John K. Mills, F. S. Corlew, Frank Carey, H. Bishop and W. S. Daniels.

Duplex Spark Plug Company.—F. Lowenstein, L. Lowenstein, A. H. Levy.

Duryea Power Company.—Charles E. Duryea, Marcus Rowe, Howard C. Daily, L. G. Luther, Thomas Gardise and Mr. Middleby.

E. H. V. Company.—G. T. Schull, general manager; D. F. Graham, general superintendent; F. C. Carter, sales manager; George A. Hodge, engineer; J. E. Savell, Boston agent; C. Wain Ward, Newark agent; M. Van Cott, Mount Vernon, N. Y., agent.

Easter Carbon Company.—E. J. Williamson, Oliver L. Turgeon, A. D. Spear.

Edmunds & Jones Manufacturing Company, Detroit.—George E. Edmunds, W. J. Connell, W. T. Jones and James McCone.

Ehret Tire and Tool Receptacle.—W. J. Boyd, William Morgan.

Elbridge Electric Manufacturing Company (Géo. H. Terry & Co.).—J. Gordon, E. W. Graef.

Electric Rubber Manufacturing Company.—H. A. Middleton, superintendent; Harry Simons, sales manager; J. Stewart Smith, New York branch; William J. Axt, New York branch.

Evansville Automobile Company.—W. M. Copeland, Louis T. Rhodes, Thos. B. Ritchie; J. C. Zutt, president.

Exide Battery Company.—Albert Taylor, New York manager; T. B. Headley, F. F. Sampson, F. B. Neely.

Ford Motor Company.—Henry Ford, John C. Dodge, James Couzens, E. L. Pelletier, Gaston Plaintiff, F. C. Vanderhoef, Louis C. Bloch and Charles Fay.

Franco-American Auto Supply Company.—Chester C. Boynton, secretary and general manager; Dillwyn M. Bell.

E. B. Gallaher, New York.—E. B. Gallaher, E. Y. Gallaher, Alex Schwalbach, Frank H. Fauss, Andrew Kirkpatrick, Mark Eisner, William L. Colt, James Laughlan, A. R. Davis and S. W. Hartley.

Gabriel Horn Manufacturing Company, Cleveland, O.—L. C. Burnett, C. H. Foster, J. F. Gibler, Jacob Wett and J. A. Shadwick.

Gemmer Engine Company.—G. A. Gemmer.

General Electric Company, Schenectady, N. Y.—W. D. Jennings and H. C. Van Weelden.

The Gilbert Manufacturing Company.—F. E. Bowers, F. W. Brown, C. B. Atwater.

Goodrich Company.—H. E. Raymond, Akron; H. A. Wills, Akron; E. Bonham, Akron; F. Y. Stewart, New York; H. B. Niblett, New York; W. H. Hart, W. Whitenock, H. A. Renshaw, A. Schober, E. Dockery.

Goodyear Tire and Rubber Company, Akron, O.—G. M. Gradelman, O. L. Weaver, A. F. Ostelot, W. F. Teagan, K. B. Harwood, Fred Campbell, H. R. Simpson, H. G. Fitler, C. E. Dustin and H. D. Benner.

Gould Storage Battery Company.—William H. Conant, manager vehicle department; Charles M. Ripley, H. A. Fay.

Gray & Davis.—William Gray, Henry Elkins; F. E. Caswell, sales manager.

Gray-Hawley Manufacturing Company, Detroit.—E. P. Gray, George E. Hawley, Forrest E. Taylor, C. S. Hawley, Manning Leonard and R. A. Jackson.

Graygood Shock Absorber Company.—Charles W. Graham, president; E. J. Smith, engineer; E. S. Aker, sales manager; Edward F. Goodman.

Grout Bros. Auto Company.—W. J. Gould, W. F. Adams, Luther Allen, P. H. Johnson, Paul R. Curtis.

C. T. Ham Manufacturing Company.—W. A. Graham, G. A. Graham, J. Barnes, C. A. Hogland, W. J. Lockwood, Thomas E. Hoffman, E. B. Carpenter.

Harburg Tire Company.—R. L. Kingston, general manager; F. G. Hill, city sales agent; T. A. Johnson, J. C. Phelps.

A. W. Harris Oil Company, Providence, R. I.—F. T. Bailey, Howard A. Grant, Ben S. Terry, W. T. Kincaid and G. L. Munroe.

D. P. Harris (Rivera).—M. H. Schnader, Harry Miner, Harry Miner, Jr.

Harrison Wagon Company.—R. J. Harrison, W. A. Hatcher, Chas. Craig.

Hartford Rubber Works Company.—Thomas G. Midgley, president; J. W. Gilson, secretary-treasurer; E. S. Roe, New York manager; E. R. Benson, Boston manager; Alex O. Halgood; Frank Kesser, Philadelphia; W. H. Barnes, Philadelphia; George Ostendorf, Buffalo; Herbert L. Severance, Buffalo; C. Langmaid, Boston; Richard Clunan, New England manager; Robert H. La Porte, Pennsylvania manager; A. D. Cruden, New Jersey manager; W. C. Holmes, New York State and Long Island manager; E. J. Davern, New York City.

Hartford Suspension Company (Gobron Brillie).—C. H. Westen, E. H. Robinson, A. G. Hofman, E. V. Hartford, E. DeWardner.

Hartford Suspension Company.—E. E. Robertson, Arthur Waterman.

Heinze Electric Company, Lowell, Mass.—J. O. Heinze, Pierre J. Legere, R. F. Goodwood, A. B. Bliss and Frank Weston.

Hendee Manufacturing Company.—G. M. Hendee, Oscar Hedstrom, F. C. Hoyt, F. A. Baker, Frank Baker.

Herz & Co., New York.—L. G. Herz and H. E. Weber.

Morgan & Wright, Chicago.—E. S. Hilton, J. B. Tower, Mr. Squires, Mr. Green and T. R. Burton.

Hess-Bright Manufacturing Company.—Henry Hess, F. R. Bright, E. J. Bachle, A. K. Nair.

Hicks Speed Indicator Company.—Dr. E. A. Hicks, Orin Frink, Carl Knopf.

Hoeflecker Speedometer Company.—L. J. Wyman, H. C. Comstock, Mr. S. Fuller, Geo. C. Bell.

Holsman Automobile Company.—W. Hildreth, Vincent Bendix, W. S. Williamson, W. T. Hunt, C. J. Bloom, Sheldon W. Case, J. J. Kerwin.

Hyatt Roller Bearing Company.—P. S. Steenstrup, secretary and sales manager; H. A. Brown, Jr., Eastern representative; C. A. Sloan, New York representative.

Igniter Appliance Company, Cleveland, O.—C. W. Hunt, Arthur R. Bullock and Mrs. Arthur R. Bullock.

Italia Import Company, New York.—E. Lillie, E. Shotwell and H. Lownesbury.

Jackson Automobile Company.—F. L. Holmes, H. E. Mathews, W. H. Diehl, E. F. Schieffer, Chas. W. Oathout, E. P. Blake.

Thos. B. Jeffery & Co.—O. C. Hutchinson, G. M. Berry, W. J. Bowman, G. H. Cox, E. A. Gilmore, W. F. Smith, George H. Conover, H. R. DeGroat, J. H. Dawson, C. E. Beach, H. R. Allen, S. A. Marks and E. Adams.

Johnson Service Company.—Prof. W. S. Johnson, president; A. R. Femald, Carl Johnson, H. D. Bristol, B. T. Voute.

The Jones Speedometer Company.—Geo. L. Holmes, B. F. Smith, A. B. Hance, Frank Sanford.

Kilgore Air Cushion Company, Boston, Mass.—S. F. Heath, F. O. Kilgore, V. J. Jacobs, Albert Lodge and Stillman G. Whittaker.

Kinsey Manufacturing Company, Dayton, O.—T. J. Kehoe and Ralph Klein.

Brownell-Trebert Company, Rochester, N. Y.—P. A. Brownell, G. E. Hazard and V. W. Kliesrath.

Knox Motor Truck Company.—Harry Knox, W. G. Morse, Gus Henley, R. A. Williams, Geo. Ruch, A. H. Patterson, Wm. Mosman.

Lane Motor Vehicle Company.—Silas Lane, H. A. Wright, W. G. Richardson, F. C. Schussler.

The Lansden Company.—John M. Lansden, Jr., F. A. Whitten, C. F. Schutter.

Lavalette & Co.—Pierre Bessy, Chas. Bischof, Mons. Dugass.

Oscar Lear Auto Company.—President Frear, Secretary, Sterne, Superintendent W. J. Miller, Frank Libby, Frank T. Fowler.

Light Manufacturing and Foundry Company.—E. S. Fretz, Moore Kelley, W. J. Grubb, E. R. Castel.

Carl E. Lipman, Beloit, Wis.—C. E. Lipman and L. H. Parker.

Logan Construction Company.—B. A. Gram, B. W. Twyman, F. C. Lindoerfer, F. Biszantz.

Long & Mann.—Wm. G. Cochrane.

Manhattan Screw and Stamping Company.—E. R. Willner, Henry Heimer, L. F. Lealand, C. J. Downing.

Marion Motor Car Company.—J. S. Conwell, Frank Leary.

Maxwell-Briscoe Motor Company.—A. B. Barkman, T. L. Marshall, J. K. McKeough, C. G. Bleasdale, F. J. Tyler, W. C. Longstreth, T. J. Tower.

Mercedes Import Company, New York.—T. McCall, Mr. Stillman, Mr. Jones, J. T. Smith and P. V. Clondis.

Michelin Products Selling Company.—E. W. Elverson, treasurer and general manager; John S. Wiese, general sales manager; M. J. Dobler; J. L. Keir, Philadelphia agent; J. S. Griffin, Newark agent.

Midgley Manufacturing Company.—P. J. Cull, C. D. Ford.

Charles E. Miller.—Charles E. Miller, William Pederson.

William P. Miller's Sons.—C. Gardner Miller, Arthur E. Miller, E. H. Rushmore.

Mills Manufacturing Company.—Thomas E. Mills.

Milwaukee Motor Company.—H. J. Goertz.

Mitchell Motor Car Company.—G. V. Rogers, secretary; J. W. Bate, chief engineer; W. M. Lewis, general manager; James M. Cram, sales manager.

Model Gas Engine Company.—M. Pollock, William C. Barker, Eastern managers; V. Rohe.

Moline Automobile Company.—C. H. Vandevoort and W. Nicholson.

Moon Motor Car Company.—E. J. Moon, president; L. P. Mooers, designer; L. J. Sackett.

Mora Motor Car Company.—S. H. Mora, president; W. N. Freeman, treasurer; William B. Birdsall, designer.

Moore Automobile Company.—W. J. Moore, W. J. Bartley, Edward Fifield, Frank Sibley.

A. R. Mosler.—A. R. Mosler, Wm. Liebling, H. A. Fish.

Motor Car Company.—R. A. Palmer, secretary; George A. Young, salesman, Detroit; George Reason, salesman, Detroit; Byron J. Carter, salesman, Detroit; Percy Harvey, salesman, Detroit; Ralph Snyder, salesman, Detroit.

Motz Clincher Tire and Rubber Company.—Mr. H. C. Comstocker, Chas. Motz, Geo. C. Bell, S. Fuller.

Muncie Auto Parts Company, Muncie, Ind.—H. S. Werner and H. L. Hooke.

Hartford Auto Parts Company, Hartford, Conn.—J. S. Bretz, Wm. Schultz and Mr. Bretz, Jr.

Napier Motor Car Company of America.—H. L. Moody, A. Ritter, Phillip T. French, Eugene Thayer, E. S. Hare, Mr. Ledwinka, A. J. Doty, H. S. Kirbaugh.

National Carbon Company.—M. H. Moffatt, A. E. Carrier, A. C. Henry.

National Motor Vehicle Company, Indianapolis.—Parker Morris, F. E. Boland, J. P. Boland, George Dixon, Mr. Wall and S. S. Thorne.

N. Y. & N. J. Lubricants Company.—W. J. Kimball, Jos. H. Bennis, J. D. Kelvie, A. H. Warner.

Nordyke & Marmon Company.—W. C. Marmon, secretary; H. C. Marmon, chief engineer; H. H. Rice, manager; L. H. Roberts, salesman; W. W. Reagan, salesman.

Oliver Instrument Company, Minneapolis, Minn.—H. E. Pence, E. C. Oliver and C. A. Ault.

Oliver Manufacturing Company, Chicago.—W. B. Lloyd, J. J. Kellier, R. J. McKinnon.

Ovington Motor Company.—E. J. Ovington, R. W. Ovington, Fred Berger.

Palais de l'Automobile, New York.—Henry Neubauer, F. D. Middleton and Samuel Suskind.

Palmer & Christie.—Mr. Palmer, Mr. Christie.

Pannard & Levassor.—A. Massenat, A. DeMagnin, George Post, Frank Post and Alfred Cutler Morse.

Pennsylvania Auto Motor Company.—Chas. McIlvain, Whitney Smith, Chas. Stowell, Harry Newman, F. S. Walton.

Pennsylvania Rubber Company.—H. W. DuPuy, Wilmer Dunbar, A. M. Joralemon, F. W. Walters, F. P. Hayes, A. G. Clarke, J. H. McCullaugh.

Pierce Engine Company.—President Pierce, L. B. Butler, F. E. Parke, Superintendent Reed, J. Hansen.

Pittsfield Spark Coil Company.—William P. Wood, treasurer; E. B. Jacobson, engineer; Arthur Wentworth, J. E. Wood.

Post & Lester Company.—David J. Post, president; H. W. Lester, vice-president; C. B. Lamb, secretary.

Premier Motor Car Company, Indianapolis, Ind.—R. J. Eads and G. A. Widely.

Prest-O-Lite Company, Indianapolis, Ind.—C. G. Fisher, J. A. Allison, Earl Fisher, M. A. Paxton and Walter Schott.

Thomas Prosser & Son.—Thomas Prosser, H. D. Haight, Richard Prosser.

J. M. Quimby & Co.—Emerson Brooks, Herbert Strong, W. W. Ogden.

Rainier Company.—John T. Rainier, M. B. Lineberger and A. Peterson.

Rands Manufacturing Company, Detroit.—W. C. Rands and J. O. Teevin.

Rapid Motor Vehicle Company.—Max Grabowsky, Morris Grabowsky, H. G. Hamilton, L. B. Butler, S. Burr, Mr. VonWestbergh.

Reading Standard Cycle Manufacturing Company.—G. W. Sherman, G. W. Leinbach, A. E. Griffith, George Piper.

Renault Frères Selling Branch, New York.—Paul Lacroix, H. U. Kibbe and M. G. Bernin.

Reo Motor Car Company, Lansing, Mich.—R. M. Owen, R. M. Owen, Mr. Singer, Mr. Cohan, Mr. Lockwood and R. C. Rueschaw.

Rojis-Royce, Ltd., London, England.—Hon. C .S. Rolls, Capt. Hutton, R. A. McCready and T. Smith.

St. John Rubber Tire Company, Inc.—Benjamin Moore, president; E. V. Morrell, treasurer; E. W. Morrow, sales manager; G. W. Knowlton, C. F. Healy.

St. Louis Car Company.—Walter S. Miller, general manager; George C. John, sales manager; L. A. Hopkins, New York manager.

St. Louis Motor Car Company.—Jesse French, vice-president; John Miller, superintendent; J. W. Kerr, demonstrator; T. B. Van Alstyne, sales manager; Messrs. Graham & Goodman, New York agents.

J. H. Sager Company, Rochester, N. Y.—J. H. Sager and C. J. Ivens.

Scandinavian Fur and Leather Company.—Julian H. Wildman.

Shelby Steel Tube Company, Pittsburg, Pa.—H. S. White, R. B. Harris, C. R. Cumming and Henry Ramsey.

Simplex Motor Cycles.—G. E. Ray and J. McGoukin.

Smith Automobile Company.—C. Smith, M. A. Driscoll, C. T. Silver, J. Billings.

R. H. Smith Manufacturing Company.—R. H. Smith, Frank Weston, Charles Vincent, Harold P. Ferre.

Société Industrielle des Telephones (Pneu L'Electric).—Arthur J. Myer, Frederick Komp, A. Epstein, William Coleman, J. E. M. Hall, Albert L. Kull.

Spicer Universal Joint Manufacturing Company.—T. J. Wetzer, J. W. Pierce.

C. F. Splitdorf.—W. J. Hart, F. S. Perrin.

Sprague Umbrella Company.—Col. Sprague, F. Dillingham, J. Breckenridge, J. Bush, A. Herman, F. Luffey.

Standard Welding Company.—W. S. Gordon, W. H. Pirrong, H. W. Davis, L. D. Rockwell.

Schwartz Wheel Company.—Arthur H. Littleton, Chas. W. Schwartz.

E. W. Sutphen, New York.—J. E. Demar and F. Rose.

Swinehart Clincher Tire and Rubber Company.—E. O. Hoopengarner, A. L. Siegist, B. C. Swinehart, A. G. Hendel, C. E. Brine.

C. A. Tileson Company.—C. A. Tileson, C. F. Terhune, J. W. Capen.

Tire Safety Device Company.—C. R. Bissell, R. W. Reinhold.

Torbensen Motor Car Company.—V. V. Torbensen, J. L. Edland, L. P. Martin.

Turner & Fish, Chicago.—Henry J. Fish, S. J. Turner, Wm. E. Metzel and Fred Weber.

Uncas Specialty Company, Norwich, Conn.—B. L. Leavitt, A. H. Green, George Gould and L. Hansen.

Vestal Shock Absorber Company, Pittsburg, Pa.—R. M. Vestal and O. E. Vestal.

Wagoner Motor Cycle Company.—Harry S. Lyons.

Warner Gear Company.—C. W. Warner, Ray P. Johnson, H. L. Johnson.

Warner Inst. Company.—A. P. Warner, Sidney A. Bean, Arthur Inderreeden, Daniel E. Sullivan, John R. Ditmars, Francis J. Nicodemus, Jens Simoni, Robert Shaw, Irving Bean, C. J. Appelbe, Charles Bishop, F. Perkins, E. W. King.

Wayne Automobile Company.—Chas. L. Palms, Wm. Kelley, Roger J. Sullivan, J. H. O'Brien, J. S. Draper.

Webb Manufacturing Company.—E. H. Webb, H. W. Webb, L. Berger.

Welch Motor Car Company.—B. Hamilton, P. B. Strong, L. H. Pearlman, C. E. Gosenheim.

Société Anonyme Westinghouse, New York.—A. M. Thackera, M. Coster, J. A. Camprubi, J. C. McQuistan, C. A. Wombbell and C. D. Brown.

F. H. Wheeler, Indianapolis, Ind.—F. H. Wheeler, George M. Schebler and E. J. Edmond.

White Sewing Machine Company.—C. H. Page, E. A. Gilmore, J. W. Ball, J. Bell, Jr., H. Williams, H. Unwin, B. F. Adams, L. Kelso, B. Y. Frost, J. R. Paker, R. Green, H. Esselstein, D. Rankin, J. Dixon, B. Shearer, A C Keene, H. Taylor, D. Mann.

Whitlock Coil Pipe Company.—R. D. Bobson.

Whitney Manufacturing Company.—W. W. Totman, W. J. Belcher.

E. J. Willis Company.—E. J. Willis, president; A. Ross Jarman, Charles S. Dyde, W. E. Baker, Mr. De Vere.

Winchester Speedodometer Company.—E. T. Bloxham, F. H. Cross, Irving P. Fay, Arnold Sammis.

Witherbee Igniter Company, New York.—A. B. Elliott, A. S. Watson, A. J. Fisk and H. H. Cooley.

Walter H. Woods.—Jas. Lieven, Harold Bater, Otto B. Cole.

Woods Motor Vehicle Company.—C. E. Metzger, F. J. Noon, W. J. Greeneich, Louis Burr.

Wray Pump & Reg. Company.—G. W. Kellog.

Wm. Wurtzburger.—W. L. Miller, J. W. Cushing, Guy W. Shoemaker.

Bouton Motor Company, York Motor Car Company.—M. D. Bouton, president; A. H. Chadborn, sales manager; H. T. Birnie, assistant sales manager; James Fairman, assistant manager York Motor Car Company; James A. Cline, designer York Motor Car Company.

O. W. Young.—W. L. Montrose, A. P. Eagan, Robert Spencer, E. H. Cox, Jr., Geo. Barnes, D. C. Coleman.

Zim Rock Motor Car Company.—W. G. Houck, J. M. Houck, Walter S. Pierce, G. W. McDonald, Loe. Jackobson.

ACETYLENE AND GASOLINE TANKS THAT ARE SHOWN

S. F. Bowser & Co., Inc., Ft. Wayne, Ind.—The complete line of gasoline and oil tanks, self-measuring pumps, cabinets, and so on, made by this concern are shown. The feature of the exhibit, however, is a special cabinet for private garage use, containing two lubricating oil tanks and pumps in the cabinet itself, and between them the self-measuring gasoline pump drawing its supply from an underground tank. Tanks, pumps, and all metal work are finished in highly-burnished copper and the glass-door cabinet is finished in green, mission style, the whole making an exceedingly handsome outfit and having a surprisingly ornamental effect. Though the finish is special, it is furnished to customers on order; a duplicate of the exhibition set was recently made for a prominent New York automobilist.

Prest-O-Lite Company, Indianapolis, Ind.—In addition to the regular Prest-O-Lite compressed acetylene gas tanks in two sizes, containing 40 cubic feet and 70 cubic feet of gas, respectively, this company exhibits for the first time a tire-inflating tank which, though but 16 inches long and 3 1-2 inches in diameter, carries sufficient liquid air to inflate 25 tires. The tank is called the Prest-O-Tire, and is attached by means of a bracket and band or in any other convenient manner. It may easily be placed under a seat. In form and finish it matches the gas tanks, though much smaller. There is also a large edition of this device designed for garage use, carrying enough liquid air to charge 300 tires. Empty tanks can be exchanged for charged tanks, exactly as in the case of the gas tanks, the same depots carrying both kinds ready for immediate delivery to customers.

Avery Portable Lighting Company, Milwaukee, Wis.—Acetylene gas tanks, tire-filling tanks, and acetylene gas table lamps are shown at the Avery stand. The table lamps are shown burning on a table and present a most attractive appearance with their fancy colored shades. A small pipe leads to a gas tank, of the regular type, placed under the table, the tank containing sufficient gas to supply a 26-candlepower burner for 100 hours. The automobile tanks shown are of 50 cubic feet capacity and are filled with asbestos, the manufacturers stating that the tank is made absolutely safe in this way. The steel shells are tested to 600 pounds, have a tensile strength of 1,500 pounds, but the gas is never at a higher pressure than 300 pounds. A safety plug, set for 500 pounds, would allow the gas to escape harmlessly in case the pressure was raised by excessive heat, as in case of a fire, so that explosion is impossible.

THE SKY-PILOTS WERE MUCH IN EVIDENCE

By HAROLD H. BROWN.

THE exhibit of the Aero Club of America was placed up-stairs and can be reached only by an elevator, which is, perhaps, quite appropriate if not convenient. However, the slight inconvenience is not minded very much by the public, if one can judge by the crowded condition of the elevator at all times. The most remarkable feature is the greater prominence given by models and full size machines to the "heavier than air" type, as compared with last year's show, in which spherical and dirigible balloons predominated. This year, no full-sized balloons are shown. It was intended to have Lieut. Lahm's *United States* on exhibition, but it was unavoidably delayed. The Gordon Bennett Aero Cup is on exhibition together with the Hawley Cup. The Bennett Cup is a beautiful piece worked in solid silver, representing a dirigible in full flight. There are many balloon baskets and other paraphernalia. The line of balloon baskets, of which there are seven, range from one just large enough for one man, to another which could hold about a dozen, in which it was proposed by some Frenchmen to make a trip to the Klondike. The basket of the *Nirvana,* belonging to Dr. Thomas, is on exhibition, together with its full equipment of sand bags, anchor drag rope and instruments. These generally include a statascope which tells whether the balloon is ascending or descending, a barometer which gives the approximate height of the balloon above the earth, and a compass which indicates the direction in which the balloon is traveling.

In the line of dirigibles only one model is shown; this is the Kiel Balloplane and is somewhat of a combination of the dirigible and aeroplane. This model has a gasbag about ten feet long. Three dirigible keels are shown. That of Major Miller is fitted with a shallow wickerwork basket for two persons. In this machine Mrs. Miller and Leo Stevens recently made a short flight in Pennsylvania. Another is a keel built by Leo Stevens for his own use. The third is a machine belonging to Capt. Baldwin which has made twenty odd successful flights in the State of Washington and has just returned from a number of successful trips in the South. Both this machine and the Miller machine are propelled by a two-cylinder motor of American manufacture.

Many Light Motors Are Shown.

The most interesting part of the exhibit, to a student of the subject, is the remarkably fine collection of light gasoline motors which are especially designed to meet the requirements of aeronautical work. Probably the most interesting of these, all things considered, is the Manley motor, designed for the late Prof. Langley's full-sized aerodrome with which he experimented on the Potomac in 1903. This machine weighs, with cooling water and all accessories, 200 pounds, and during a continuous brake test of five hours on a water dynamometer delivered 52.4 horsepower. The motor itself weighs only 125 pounds. It is built on somewhat remarkable lines; it is a five-cylinder machine, the cylinders being set radially around the crankshaft and all working on one crank. The flywheels are of bicycle construction, placed on both sides of the cylinders and have U-shaped rims; they are about four feet in diameter. The inlet valves are automatic and the cylinders are about four and a half by four and a half. Ignition is by jump spark, the spark plugs being placed in the heads of the cylinders. The water jackets are riveted in place, and the construction of the jackets reminds one of the 1906 Locomobile racing car, although the jackets are of steel and not copper, as in the case of the Locomobile. The starting shaft is at right angle to the crankshaft and has a worm on it which engages with a worm wheel on the crankshaft. The worm slides longitudinally on its starting shaft, and is thus thrown automatically out of the way when the engine starts up.

Probably next in interest is the Wright Brothers' machine, this being similar to that used on their many successful flights. This machine has four cylinders, 4 1-4 by 4 inches, and weighs 160 pounds. It probably develops not more than 24 horsepower. The valves are in the heads, automatic inlet valves being employed. Make-and-break spark is used, this being operated by a horizontal shaft on the side of the cylinders and operated by bevel gears on a vertical shaft which in turn is driven from the camshaft. The crankcase is of the open type, closed in by a sheet of aluminum. In general appearance it reminds one of the 1904 Buffalo engine. While no metal is wasted, yet the machine does not have the usual marks of great effort to save weight such as hollow crankshafts, etc., which is generally conspicuous on most flying machine engines. On the whole, the outward appearance of this machine is somewhat crude; in fact, its very crudeness would tend to show the great perfection which the Wrights' flying machine has reached as judged by its performances.

Several motors of ingenious design are shown which as yet have simply had a brake test but have not been applied to any machine. Among these is a machine, exhibited by Thomas G. Washburn, which is a four-cylinder of the two-cycle three-port type. The two cylinders are arranged around the crankcase in a similar manner to that employed by Manley. They are set at 45° from the vertical plane. Two opposite cylinders work on the same crank and the cranks are set at 90°. The machine is shown with a propeller attached, and it is altogether a neat piece of work. It weighs 35 pounds and it is said to develop 11 horsepower.

Perhaps the most complete line of light motors is that shown by the Curtis Manufacturing Company. This line includes one, two, four and eight-cylinder motors. The latter is on the lines of the Antoinette motor which was used by Santos-Dumont. It weighs 125 pounds and is said to develop 30 horsepower. Other motors are the Tygard, which is double-acting; one shown by Carl Fisher, which weighs 87 pounds and develops 12 horsepower, and a very neat motor shown by Harry E. Day, which is rated at 7 1-2 horsepower.

The Wind Wagon Assortment.

Gustav Whitehead, of Bridgeport, Conn., has on exhibition a wind wagon, which was probably designed as part of a flying machine. It consists of a boat-shaped frame on four wheels propelled by an inverted two-cycle engine in the rear. He also shows a smaller two-cycle engine with propeller attached. This was at one time placed on a gliding machine of the Herring type and made a number of successful captive flights. The cooling system used on both these motors is peculiar; it consists of a large number of irregular-shaped copper strips which radiate from the surface of the motor.

Professor Pickering, of Harvard College, shows a tricycle propelled by an aerial screw driven by the pedals of the machine.

Roy Knabenshue and Other Exhibitors.

Roy Knabenshue, who somewhat over a year ago made a number of successful flights over New York City, shows a frame on which two propellers are mounted together with a small motor similar to that which he used on his airship. The frame is rectangular and has at its forward end a skeleton cross arm on which the propellers are mounted. These are driven from the countershaft mounted in the frame by means of wide, flat belts. This is intended to form part of an aeroplane machine.

Gillespie shows two machines of the aeroplane type: one a model and the other a full-sized machine. The full-sized machine is about 25 feet long and about 10 feet wide. It is actuated by four propellers, is mounted on two wheels at the center, and has steadying wheels at either end. It is propelled by a six-cylinder horizontal air-cooled motor of the opposed type. This motor, unfortunately, was not of sufficient power. The model, which as

yet has not been tried, as it was just completed in time for the show, is on somewhat different lines. It consists of two pairs of superposed following planes with a forward steering plane.

A rather interesting model, as being the invention of a woman, is shown by Miss E. L. Todd. This has a frame which contains two lifting screws and two propelling screws, the latter mounted in rear. This frame is mounted on wheels. Above this frame is a double aeroplane connected somewhat flexibly to the frame. The propellers are driven by means of shafting and bevel gears from an electric motor which obtains its power for experimental purposes from an electric cable which is paid out as the machine advances.

One full-sized flapping wing machine is shown, the invention of Amos Andrews. It measures 52 feet from tip to tip of the wings. The wings are at the ends of a short, stationary plane and are themselves plane surfaces. The wings are worked by connecting rods operated by a crank on a large gear driven by the motor, which is of 6 horsepower. The machine, without operator, weighs about 600 pounds and has not over 600 square feet of sustaining surface.

Mr. Willson shows a model of a peculiar beating wing motion. He claims to have made a successful flight of over 1,000 feet with a full-sized machine of this type propelled only by manual power. Mr. Kimball has a neat model of a lifting screw machine propelled by twisted rubber bands. This actually made a number of successful flights in the hall when the crowd was not very thick, as a demonstration of its practicability.

There are numerous box and other forms of kites scattered around the ceiling, and Dr. Thomas exhibits a laboratory hydrogen generating set. There are also a number of aerial screws of various models shown.

Arranged around the wall, as was the case last year, are a large number of good photographs of various airship and balloon ascensions.

The moving-picture exhibit, which is considered part of the Aero Club's show, has some good views of the Gordon Bennett race. From these one can get a good idea of the manner of inflating spherical balloons and preparing them for an ascension. One very interesting part of this series of views was the testing and starting out of Santos-Dumont's motor ballasted balloon. This balloon was furnished with a small gasoline motor which operated a couple of lifting screws, the idea being to very nearly balance the balloon in the air and control its upward and downward movement by the motor without either losing gas or ballast to any great extent.

On the whole, the exhibit is very interesting and probably gives one as good an idea of the state of the art as under the circumstances could be readily expected.

EXHIBITS OF VARIOUS KINDS AT THE PALACE SHOW

Gray-Hawley Manufacturing Company, Detroit, Mich.—Mufflers and exhaust-blown signals are here shown. The 1907 Autochime has been improved by the addition of a third tone, making the combined sound fuller and richer as well as more powerful. The size is the same as in the 1906 model. An interesting exhibit is the combined autochime and muffler.

Manhattan Screw and Stamping Works, New York.—Acetylene and oil lamps, horns, oil guns, brackets and other automobile attachments. In addition to a full line of gas lights with lens mirrors and condensing lenses there is a very interesting tail lamp, called the Tattle Tale lamp, burning oil, which is so arranged that the driver can tell whether it is burning or not without leaving his seat.

Allen & Kilduchevsky.—A four-cycle, four-cylinder engine of 75-80 horsepower is shown, with cylinders 6 by 6 inches. This engine is built with a view to light weight, running from 380 to 400 pounds. The highest grade materials are used, Krupp chrome nickel steel, Ajax plastic bronze, and aluminum.

Gilbert Manufacturing Company, New Haven, Conn.—Fabric supplies of all kinds are shown at this stand—tire cases, lamp covers, bags, tool rolls, leggings—in fact, practically everything that can be made of the special fabrics used by the Gilbert company for automobile work.

J. H. Sager Company.—The Sager tire grips are new this year; the chains are attached to two steel rings, one on each side of the rim. Each wing is made in four segments, joined by plain pins and split-pins; the ends of the chains are attached to the segments in the same way, as each segment is perforated with holes at close intervals, and any stretch may be readily taken up by shifting a pin to a new hole. Four leather straps under the pins prevent any creeping.

Oliver Manufacturing Company.—The regular 11-inch by 13-inch sizes of the Peerless jack have been supplemented by a new model, smaller and lighter, but of two tons capacity, without the bottom bracket; a very compact and convenient jack in two sizes: 10 and 12 inches. There is also a new model of the Samson jack, for garage use for cars up to six tons. Another new jack is of the ratchet screw type, for automobile trucks of up to ten tons.

Spicer Universal Joint Co.—The Spicer universal joint for 1907 has an additional outer shell or casing for the purpose of more effectually excluding dust and dirt. The packing, which was formerly within the main shell, is now placed between the two parts of the outer shell. Several sizes are shown.

CARBURETERS.

The Schebler Carbureter, in the main, is unchanged from the 1906 models. However, there has been added a central draft model in which the main air inlet is entirely distinct from the auxiliary air, and enters at the center of the float chamber.

The Kingston Carbureter was shown by its manufacturers, the Byrne, Kingston Company, in its various models. The new 1907 models are all of the annular float chamber central draft type. They also show a good line of coils, commutators, mufflers, and circulating pumps, all of their own manufacture.

The Holley Carbureter was shown by Charles Miller. The line includes about all the leading styles and quite a number of special types particularly adapted for machines of a given manufacture.

The Breeze Carbureter was shown by E. J. Willis. This concern has brought out a model for large cars in which the float and its mechanism are especially accessible. This carbureter is of the annular float chamber central draft type.

CHAINS.

Diamond Chain and Manufacturing Company, Indianapolis, Ind.—In addition to its standard line of chains this company is now putting out a special type of front axle for trucks and other heavy vehicles. It is now making a line of chains from chrome nickel steel.

Baldwin Chain and Manufacturing Company, Worcester, Mass.—The Baldwin chains are shown in large variety. The Baldwin spring recoil check with double coil springs has been further improved. A special type of hose-link chain is made as a part of this check and is also adaptable to other uses. The McKinney removable tire holder is also shown.

Whitney Manufacturing Company, Hartford, Conn.—The well-known Whitney chains are shown with little change from last year. The new factory of the company will soon give increased facilities for their manufacture.

STATE BODIES TO DO A. A. A. WORK.

At the December monthly meeting of the A. A. A. Board of Directors, held Tuesday afternoon in Convention Hall, at the Grand Central Palace, the constitution was subjected to radical changes, which hereafter will mean the transfer of the bulk of the work to the State associations, which will also receive three-quarters of the annual dues. Furthermore the State association will elect the national Board of Directors. Any State having at least three clubs, or a total membership of 100, will have power to form a State body and practically become supreme in its own territory.

Present at the meeting were Third Vice-President L. R. Speare, Boston, who occupied the chair; Secretary S. S. Gorham, Chicago; Treasurer G. E. Farrington, East Orange, N. J.; and Directors Dave Hennen Morris, A. C. A.; W. T. White, Cleveland; E. L. Haynes, Springfield, Mass.; J. P. Coghlin, Worcester, Mass.; F. H. Elliott, Syracuse, N. Y.; N. M. Pierce, Binghamton, N. Y.; F. R. Pratt, Newark, N. J.; G. A. Post, Paterson, N. J.; J. H. Edwards, Jersey City, N. J.; A. R. Pardington, Brooklyn, and A. G. Batchelder, New York. Chairman J. D. Thompson, of the A. A. A. Racing Board, and President O. A. Quayle, of the New York State Association, were also in attendance.

Chairman Thompson made a partial report of the Vanderbilt Cup race receipts, and handed Treasurer Farrington a check for $10,000, which will be used in carrying on the general work of the association. A vote of thanks to the Racing Board unanimously followed.

These clubs were admitted to membership: Quaker City Motor Club, Philadelphia; Automobile Club of Union County, Plainfield, N. J.; Tidewater Automobile Club, Norfolk, Va.; Maryland Motor Association, Baltimore, Md. Sixty individual members were also admitted.

January 17 will be the date of the annual meeting, to take place in New York City. A nominating committee consisting of G. E. Farrington, A. R. Pardington, and A. G. Batchelder was designated to consult with the clubs and prepare nominations.

Judge William H. Hotchkiss, of the Automobile Club of Buffalo, the present first vice-president of the A. A. A., is a likely candidate for the presidency in case he will accept the place. F. H. Elliott, present secretary of the New York State Association, has been suggested as a successor to Secretary Sidney S. Gorham, who does not desire a re-election. Mr. Elliott would locate in New York City.

Hereafter the State associations will only pay into the national treasury 25 cents for each member. Formerly there has been an even division of the annual dues.

A general convention of the A. A. A. will be held at Chicago in February, during the automobile show in that city.

THE FUNCTIONS OF THE WEEK.

Show week has been a busy one in the line of entertainments, and there have been numerous meetings and many dinners. The smoker of the New York Motor Club, Sunday night, opened the proceedings. Tuesday there was a meeting of the A. A. A. Board of Directors, and also an informal luncheon at the rooms of the New York Motor Club. H. Sargeant Michaels and Dr. Gardner S. Chapin, who recently arrived in town after a most exhausting trip between Chicago and New York, were entertained by the Haynes Motor Car Company. The tourists made careful observations and took some 1,800 photographs, all of which material is intended to be of assistance in the proposed New York-Chicago highway.

Wednesday evening the Long Island Automobile Club held its annual dinner at its clubrooms in Brooklyn. Over 300 Maxwell agents were given a dinner at the Knickerbocker Hotel by the Maxwell-Briscoe Motor Company. The Executive Committee of the National Association of Automobile Manufacturers held a business session at the East Forty-second street headquarters. The Aero Club of America gave a dinner at the Murray Hill Hotel, all the noted sky-pilots being in attendance.

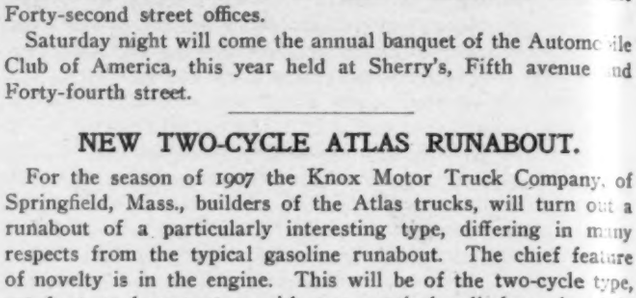
Thursday the schedule calls for a meeting of the Board of Directors of the New York State Association of the American Automobile Association, and a luncheon to A. C. A. show exhibitors at the Hotel Manhattan by the American Motor Car Manufacturers' Association.

Friday the mechanical branch of the Association of Licensed Automobile Manufacturers will hold a session at the East Forty-second street offices.

Saturday night will come the annual banquet of the Automobile Club of America, this year held at Sherry's, Fifth avenue and Forty-fourth street.

NEW TWO-CYCLE ATLAS RUNABOUT.

For the season of 1907 the Knox Motor Truck Company, of Springfield, Mass., builders of the Atlas trucks, will turn out a runabout of a particularly interesting type, differing in many respects from the typical gasoline runabout. The chief feature of novelty is in the engine. This will be of the two-cycle type, rated at 20 horsepower, with two vertical cylinders placed in front under the bonnet, and the peculiar arrangement of the valve ports is the strong point of the motor. The exhaust gases are given a very free outlet, passing through a port in the piston and thence through ports in the cylinder walls communicating with an annular exhaust space. Gas is admitted from above, and it is claimed that there is practically no mixing of the exhaust and the new charge.



KNOX MOTOR TRUCK CO.'S 20-H.P. RUNABOUT.

The car is of the runabout type with steel frame and aluminum body carried on four three-quarter elliptic springs. Drive is through a two-speed planetary gear inclosed in an oil-tight case, with final drive by propeller shaft and bevel gears to the live rear axle. The gears are hardened and there is one universal joint at the forward end of the propeller shaft. The wheels are 30 inches in diameter, with 3-inch tires and the wheelbase is 90 inches, standard gauge. The motor is water-cooled, having copper jackets, and circulation is maintained by thermo-syphonic action, no pump being required. For controlling the car there is a single lever on the steering wheel which actuates both timer and throttle; a side lever controlling the two forward speeds, and pedals for the two brakes and the reverse. The gasoline tank carries 12 gallons. The maximum speed is given as 40 miles an hour and the car is said to be a particularly good hill climber on account of the even torque of the two-cycle motor and the light weight of the vehicle in proportion to the power—1,200 pounds to 20 horsepower. The price is $1,250.

IMPORTED CARS AT THE A. L. A. M. SHOW.

A very important feature of the Madison Square Garden show, to be held January 12-19, will be the foreign exhibit. At the recent meeting of the Importers' Automobile Salon, Inc., it was unanimously decided that the Salon should endeavor to make the foreign exhibit surpass any of the former years. This will be made possible, as the date of the Garden show is such that all the interesting exhibits of the Paris Salon can be shipped in time to be here by January 12.

NEWS AND TRADE MISCELLANY.

The Motor Equipment Company, of Seattle, Wash., has filed articles of incorporation, the capital stock being $15,000. The incorporators are E. J. Strelau, F. A. Wing, and G. W. Miller.

The manufacturers of the Truffault-Hartford suspension announce that the Nordyke & Marmon Company, builder of the Marmon car, has adopted the Truffault-Hartford shock absorber as part of the regular equipment of its 1907 cars.

The capital stock of the Rainier Company, of New York, has been increased to $500,000, following the rapid increase of business and the opening of a new garage in New York. J. T. Rainier remains president and treasurer and Mr. Lineberger vice-president and general manager.

The Chicago Motor Car Company, Chicago representatives of the Packard Motor Car Company, recently moved into new premises at 1526 Michigan avenue. The place vacated at 1334 Michigan avenue is occupied by R. M. Owen & Co., who have removed from 1408 Michigan avenue.

The D. P. Collins Company, which recently embarked in the auto business, has added to its big garage in Seventh avenue a complete tire-repairing department, the only one in the downtown section. Mr. Collins, president of the company, was for several years head salesman for the Bankers Bros. Company.

Wheeler & Schebler, Indianapolis, Ind., manufacturers of the Schebler carbureter, expect to occupy their new factory building about January 1. The foundry and machine shops will occupy about two acres of floor space, and 500 men will be employed. The buildings are now rapidly nearing completion.

Smith & Mabley, of Broadway and Fifty-sixth street, New York, manufacturers of the S. & M. Simplex cars, have decided, after extensive trials and tests, to have all their cars equipped with Continental tires. Continental tires have been fitted to the cars imported by this concern for some time.

The New York branch of the Packard Motor Car Company has joined the general uptown movement of the automobile agencies and will on March 1 next take possession of a six-story building that is now being erected at the northwest corner of Broadway and Sixty-second street. The new quarters will be spacious, well equipped, and modern throughout.

The National Tire Repair Company, of St. Paul, Minn., is making extensive improvements for the coming year. Additional machinery is being installed to enable the company to handle every possible repair pertaining to tire work. A complete line of automobile tires will also be carried in stock. William C. Craft will be the manager.

At the annual meeting of the shareholders of the Buick Motor Company in Flint, Mich., officers for the coming year were elected as follows: President, C. M. Begole; vice-president, George L. Walker; secretary, H. George; treasurer, W. S. Ballenger; general manager, W. C. Durant; directors, D. D. Buick, Flint; B. Smith, W. F. Stewart and J. H. Whiting.

New machinery is constantly being installed in the factory of the Corbin Motor Vehicle Corporation at New Britain, Conn. Work is being pushed as rapidly as possible on the 1907 models; the cars will be exhibited at the various shows, beginning at Madison Square Garden in January. Owing to the recent acceptance of membership of the Corbin company by the Association of Licensed Automobile Manufacturers, this company is obliged to accept space in Exhibition Hall, as all space had been allotted in the main building.

NEW AGENCIES ESTABLISHED.

Curtis Brothers are the new Brooklyn agents for the Franklin air-cooled cars.

W. S. Blaisdell, of the Bushwick garage on Palmetto street, Brooklyn, will handle the Walter car for 1907.

Thomas Hines and John C. Heald are to begin business in Manchester, Vt., as the Manchester Automobile Company.

The Acme Garage, Harry Hurley manager, has secured the Western Washington agency for the Motor Equipment Company.

Alex. E. Pastre, Ocean Parkway, Brooklyn, who has sold Ramblers for some years, has been given the exclusive Brooklyn agency for these machines.

The Chicago branch of the Matheson Motor Car Company has secured a location at 1321 Michigan avenue, where Paul Picard will soon have the 1907 models on exhibition.

The firm of Bishop, McCormick & Bishop, of Brooklyn, which has recently built a garage on the corner of Halsey street, near Bedford avenue, will handle the Ford car in Brooklyn.

The Rainier agency is the latest one established in Pittsburg, Pa. W. J. Bieler is manager, and the headquarters are in a handsome storeroom at 507 Wood street. The car is a 35-40-horsepower touring car, with four cylinders, and sells for $4,250 or $5,500 with limousine body.

The State Automobile Company is the latest concern in the Pittsburg, Pa., field. It will operate under a Pennsylvania charter, which was secured by the following incorporators: Frank C. Metz, Frederick G. Haas, and Harry E. Urban. This was formerly the Logan Automobile Company.

The agency for the Dragon car for New York, Brooklyn, Long Island, Westchester and Staten Island has been placed in the hands of Bishop, McCormick & Bishop, Inc. (formerly Bishop & Son), and F. G. Carris will be sales manager. Salesrooms have been secured at 1667 Broadway, New York, but no garage will be maintained in New York: stock cars will be stored at the Majestic garage on Halsey street, near Bedford avenue, Brooklyn, which is run by Bishop, McCormick & Bishop, while demonstrating cars will be kept at convenient garages in New York. An order has been placed for more than 100 Dragon cars. In the Majestic garage all cars are kept in separate stalls and each car can be handled without being inconvenienced by other machines.

PERSONAL TRADE MENTION.

Thomas Henderson, vice-president of the Winton Motor Carriage Company, who went to England to study the automobile situation there, will return after the Olympia show, arriving in New York Dec. 8.

H. P. Branstetter, of Chicago, will represent the Dragon Automobile Company in the Windy City. Mr. Branstetter is one of the old-time dealers, having started in when the business was in its infancy.

H. A. Cummings, long connected with the Broadway Automobile Company, of Seattle, Wash., has severed his connection with that company to accept the position of sales manager of the recently organized Eureka Motor Company.

J. B. Bartholomew, president of the Bartholomew Company, Peoria, Ill., sailed Tuesday last on the steamer *Tennyson* for Buenos Ayres, and will make an extensive trip through South America in the interest of the Glide cars, returning to this country in about three months.

A. T. O'Connor, late assistant sales manager for the Oldsmobile Company in Lansing, Mich., has accepted a similar position with the Packard Motor Car Company of Detroit. His place on the Olds staff will be taken by Frederick G. Seitz, who was chief of the inspection department.

RECENT INCORPORATIONS.

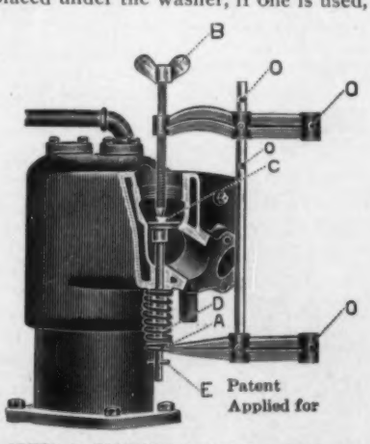
Muncie Auto Parts Company, Indianapolis, Indiana; capital stock, $50,000. J. M. Motsenbecker, president; Harry J. Hooke, secretary.

Shoemaker Automobile Company, Freeport; capital, $1,000. Incorporators, Edward L. Evans, Charles Mundhenk and C. R. Courtney.

Bayley-Willoughby Engine Company of Brooklyn; capital stock, $50,000. To manufacture and sell internal-explosive engines and motors. Directors, George H. Bayley, John Y. Watson and William H. Hein, of Brooklyn.

DEVICE FOR REMOVING VALVES.

The removal of a valve is often a very unpleasant job, owing to the difficulty that accompanies the compression of the spring to remove the key that holds it in place. A tool that makes the job an easy one has been placed on the market by Alvin & Jackson, Monadnock building, Chicago. The accompanying illustration shows the tool in actual use. The forked member *A* is placed under the washer, if one is used, or



ALVIN & JACKSON'S VALVE REMOVER.

in a coil of the spring itself, as at *D*. The thumbscrew *B* is screwed down through the opening over the valve, from which the cap has been removed, until the point comes against the valve *C*. Further screwing down compresses the spring *D* and permits the easy removal of the key *E*. To insert a valve the operation is reversed. Adjustment for a cylinder of any size can be easily made by means of the holes *O O O O*.

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